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THE MARGINAL FREEWAY

A PRELIMINARY REPORT

by

Woodruff and Sampson

AUG. 30/45

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N B. WOODRUFF
AEL SAMPSON

WOODRUFF & SAMPSON
ENGINEERS

333 MONTGOMERY ST.
SAN FRANCISCO 4
DOUGLAS 5397

CONFIDENTIAL

August 30, 1945

City Planning Commission
City and County of San Francisco
Room 252, City Hall
San Francisco, California

Lady and Gentlemen:

We are today submitting, under separate cover, our Preliminary Report on the Marginal Freeway. As submitted, it purports to be complete in accordance with our contract of May 15th with the City.

However, we would prefer that, in its present form, the Report be considered a rough draft and subject to further editing and revision. Our suggestions, in this respect, follow:

We believe it desirable that this Report be put into such shape that it can be forwarded with a suitable letter of transmittal to such City authorities as may be interested. To this end, the draft should:

a. Be reviewed by the City Planning Commission and Staff. Such modifications and/or additions as they desire should be incorporated.

b. Be reviewed by the Public Works Department. The report contains certain controversial matters. Other statements are, of course, a matter of judgment. It would be very desirable that the final draft of the Report be such that it could receive the complete endorsement of the Department of Public Works.

From our own standpoint, we desire to make a further check on our estimates of cost of construction.

There are several matters in regard to which our attention has been drawn during the preparation of the Report, or on which we were consulted informally, by the members of your staff. These matters, in general, do not come within the scope of the Report. We presume to give the following advice in connection therewith.

I. Broadway Tunnel

In our preliminary report of July 19, 1945 we recommended the construction of a comparatively short tunnel with comparatively heavy grades in order that the cost of the tunnel might be kept at a minimum. We

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EL SAMPSON

CONFIDENTIAL

August 30, 1945

City Planning Commission
City and County of San Francisco
Room 270, City Hall
San Francisco, California

Gentlemen and Gentlewomen:

We are today submitting, under separate cover, our Preliminary Report on the Municipal Freeway. As submitted, it purports to be complete in accordance with our contract of May 17th with the City.

However, as would prove true, in its progress here, the Report has changed a rough draft and subject to further editing and revision. Our suggestions, in this respect, follow:

We believe it desirable that this Report be put into such shape that it can be forwarded with a suitable letter of transmittal to such City authorities as may be interested. To this end, the draft should:

a. Be reviewed by the City Planning Commission and Staff. Such modifications and/or additions in that regard should be incorporated.

b. Be reviewed by the Public Works Department. The report contains certain controversial matters. Other statements are, of course, a matter of judgment. It would be very desirable that the final draft of the Report be such that it would receive the complete endorsement of the Department of Public Works.

From our own standpoint, we desire to make a further check on our estimates of cost of construction.

There are several matters in regard to which our attention has been drawn during the preparation of the Report, or on which we have solicited information, by the members of your staff. These matters, in general, do not come within the scope of the Report. We presume to give the following advice in connection therewith.

1. Broadway Tunnel

In our preliminary report of July 19, 1945 we recommended the construction of a comparatively short tunnel with comparatively heavy grades in order that the cost of the tunnel might be kept at a minimum. In

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have not changed our opinion in this respect. However, we did not feel that this recommendation belonged in a report on the Marginal Freeway.

II. Bayshore Freeway

Presumably the State Highway Department is proceeding rapidly with the design of the Bayshore Freeway including its connections. This Department will resist extensive changes, regardless of their desirability, after the completion of the plans. The layout of these connections is a matter in which the City Planning Commission, the Public Works Department and the Public Utilities Commission should be vitally interested. Among the points which should receive attention are:

a. Provision for mass transportation facilities

We believe one of the greatest possibilities of the Bayshore Freeway is in the opportunity it presents for rapid transit facilities between the Southern part of the City and the Central Business District. This involves a study of the routing of the lines and of loading passengers at the various interchange structures.

b. Division Street Connection - East

One of the recent studies of the City Planning Commissioninvolves a connection from Division Street towards Third Street. We have made no investigation of this proposal and are therefore unable to make any recommendations in regard thereto.

c. Division Street Connection - West

The necessity for improved connections to the Sunset District is admitted. There is a difference of opinion between the Public Works Department and the City Planning Commission as to the most desirable connection.

The expenditures involved are so great as to warrant a joint engineering report by the City Planning Commission and the Department of Public Works.

d. Sixth Street Extension

The connection to the Bayshore Freeway extending northward from Sixth and Harrison to Mason and O'Farrell was produced by the Public Works Department and approved by the City

have not changed our opinion in this respect. However, we did not feel that this recommendation belonged in a report on the Municipal Transit.

II. Zoning Ordinance

Presumably the State Highway Department is proceeding rapidly with the design of the Expressway Through Downtown Area conversations. This Department will resist extensive changes, especially at this late date, after the completion of the plans. The layout of these connections is basic in which the City Planning Commission, the Public Parks Department and the Public Utilities Commission should be actively interested. Among the points which should receive attention are:

a. Provision for Open Space Requirements

We believe one of the greatest possibilities of the Expressway Improvement is the opportunity it presents for right through flexibility between the Downtown part of the City and the Commercial Districts directly. This includes a study of the possibilities of the Close and of Loading Requirements in the various districts adjacent thereto.

b. Relation Between Expressway - Land

One of the present faults of the City Planning Commission involves a connection from Pittsburg Through Pittsburg Bypass. We have made no investigation of this problem but feel that it should be given consideration.

c. Relation Between Expressway - Land

The accessibility for industrial areas in the Second District should be studied. There is a difference of opinion between the Public Utilities Department and the City Planning Commission in the way these districts should be.

The relationship therefore will be given to the Municipal - Public Utilities Section of the City Planning Commission and the Department of Public Works.

d. Site Plan Requirements

The consideration in the Business Zoning ordinance would require Site Plans and Elevations to insure the attractive and improved development of the Public Area adjacent to the City

Planning Commission without time for thorough analysis by either agency. Our conclusion from the traffic estimates of Section V of the Report is that this construction would result in hopeless confusion at its northern terminal. Partial relief might be obtained by providing parking garages along the route.

Most of these matters will receive consideration in case favorable action results from your recommendations of August 24th to the Mayor in regard to the Market Street Study. Other funds might be available in the meantime to start that part of the work in so far as the Bayshore Freeway and its connections are concerned. In any event, the studies should be jointly organized by the City Planning Commission, the Public Works Department and the Public Utilities Commission.

Respectfully submitted

WOODRUFF & SAMPSON

Glenn B. Woodruff

Glenn B. Woodruff

GBWm

CITY PLANNING COMMISSION

CITY AND COUNTY OF SAN FRANCISCO

THE MARGINAL FREEWAY

A PRELIMINARY REPORT

Woodruff & Sampson
333 Montgomery Street
San Francisco, Calif.
August 30, 1945

B. WOODRUFF
EL SAMPSON

WOODRUFF & SAMPSON
ENGINEERS

333 MONTGOMERY ST.
SAN FRANCISCO 4
DOUGLAS 5397

August 30, 1945

City Planning Commission
City and County of San Francisco
Room 252, City Hall
San Francisco, California

Lady and Gentlemen:

We have the honor to submit a Preliminary Report on the location, design and estimates of cost of the Marginal Freeway.

Respectfully submitted

WOODRUFF & SAMPSON

By Glenn B. Woodruff
Glenn B. Woodruff

GBWm

WOODRUFF & SAMPSON
ENGINEERS

333 MONTGOMERY ST.
SAN FRANCISCO 4
DOUGLAS 5397

January 27, 1948

City Planning Commission
City and County of San Francisco
Room 282, City Hall
San Francisco, California

Lady and Gentlemen:

We have the honor to submit a preliminary report on the location, design and estimates of cost of the Ferries Freeway.

Respectfully submitted

WOODRUFF & SAMPSON

By _____
Glenn F. Woodruff

CITY PLANNING COMMISSION

CITY AND COUNTY OF SAN FRANCISCO

THE MARGINAL FREEWAY

SUMMARY OF REPORT AND OPINIONS

The MARGINAL FREEWAY is a term that has been given to an express highway, separated from the surface streets, along the eastern and northern borders of the city. The purpose of this report is to investigate the possible locations therefor, determine the need of the Freeway, recommend the type of construction that will be required and estimate the cost of construction and property.

As is the general rule with public improvements, the Marginal Freeway cannot be considered by itself but must be planned so as to become part of a coordinated system of vehicular facilities throughout the city and so as to take its proper place in the Master Plan. Among other facilities which have an important bearing on the project are:

A. The Bayshore Freeway planned for early construction by the State Highway Department. This will serve not only the counties to the south of San Francisco, but will make an excellent thoroughfare for the residents of the southern section of the city and of the Mission District and will expedite their travel either by private automobile or by express transit service to and from the Central Business District. Its advantages as compared to the existing facilities are such that it is predicted, during peak hours, it will be used to its capacity within a comparatively few years after its completion. Additional vehicular facilities and provision for off-street parking between Sixth and Harrison Streets and the Central Business District will be required.

B. Broadway was considered as a possible route for the Marginal Freeway. Such routing is not desirable but, by itself, the Broadway Tunnel is a much needed public improvement. The recommendation, in this respect, of the Mayor's Citizens Committee is well advised.

C. A Second Bay Bridge is a development which may be anticipated shortly. This will have an influence on traffic in San Francisco generally and on the Marginal Freeway in particular, similar to that of the present bridge. In the interests of proper planning of vehicular facilities throughout San Francisco, it is desirable that its location be determined as soon as practicable.

D. The Golden Gate Bridge is of direct concern to San Francisco in that the city is largely responsible for its financing. For this reason, anything that can be done to improve the approaches to this bridge is advantageous to the city.

[illegible]

[illegible]

[illegible]

The location and facilities herein recommended for the Marginal Freeway are from the intersection of Lombard and Franklin Streets via a tunnel to Columbus and Bay Streets; a viaduct along Bay Street to the Embarcadero; thence along the Embarcadero to China Basin; across the Basin to Tennessee and 19th Streets; a depressed way on Tennessee Street to 22nd Street and a viaduct along Tennessee Street to Islais Creek; a bridge over Islais Creek; and thence a limited access highway along Arthur Avenue and the waterfront to a connection with the Bayshore Freeway a short distance below the County Line.

Before recommending such a route several alternate locations were considered, only a few of which will be mentioned in this summary. With the Broadway Tunnel recommended, by the City Department of Public Works, for construction it seemed possible to make this tunnel a part of the Freeway. Analysis indicates that such would not be desirable. The Broadway Tunnel, by itself, is an essential project.

The Sixth Street Viaduct between Third and Brannan Streets has been recommended by the Public Works Department. There would be certain advantages, especially the one of avoiding a movable span over the Channel in using this viaduct as a leg of the Marginal Freeway, and thence a viaduct and tunnel to the Embarcadero. This routing is not recommended for the reason that it would increase the volume of traffic at the Sixth and Harrison interchange structure and more especially at the end of any elevated structure that may be built north thereof to reach the Central Business District.

The Public Works Department is planning the reconstruction of the Third Street Bridge over Islais Creek. There would be considerable economy in building this as a double deck structure, the upper deck to be used later as a part of the Marginal Freeway.

Along the recommended route, rock is encountered from Franklin Street to Bay Street, for a short distance along Tennessee Street and through Hunters and Candlestick Points. For the remaining parts of the location clays, silts and sands underlie the present ground surface. In some cases, especially adjacent to the Ferry Building, piles of very long lengths will be required. However, along all parts of the route, experience with the waterfront piers and other construction has demonstrated that no unusual foundation conditions will be encountered.

The estimates of traffic indicate that:

1. The capacity of the Bayshore Freeway in peak hours will be reached by 1960.

2. Several local streets, notably Columbus Avenue and Stockton Street, are approaching their capacity. While such capacity can be appreciably increased by improved traffic signals and substituting buses for street cars, it is probable that their capacity under their most efficient operation will be reached within a comparatively few years.

Admitting that future developments in transportation make long-term traffic estimates precarious, it is estimated that the average number of vehicles on certain portions of the Marginal Freeway would reach 46,000 in 1960 and 60,000, or its capacity, in 1970.

The proposed Freeway would have three traffic lanes in each direction. An additional ten-foot shoulder on each is recommended for construction at grade. Most of the viaducts involved are along streets and/or railroad yards. In order to interfere as little as possible with existing facilities, steel construction with concrete roadways is proposed for the viaduct portions.

There are differences of opinion among Highway Engineers whether such freeways should be designed to carry heavy trucks or to accommodate passenger cars only. In this case, since the Freeway will serve industrial areas largely, therefore estimates contemplate provision for heavy trucks.

Construction of this nature through developed areas is expensive. The estimates may be summarized by sections as follows:

Franklin Avenue to Ferry Building	$12,360,000
Ferry Building to King Street	3,810,000
King Street to Third Street	6,045,000
Third Street to Arthur Avenue	5,870,000
Arthur Avenue to Galvez Street	995,000
Galvez Street to Bayshore Freeway	1,890,000
Total	$30,970,000

Freeways offer the only solution to some of the transportation problems with which all major cities are faced. The most practicable solution to their financing appears to be an increase of the gasoline tax. There is the possibility of Federal Aid through the Full Employment Bill and similar measures. Cities should have plans and specifications in shape to take advantage of any funds which may become available from such sources.

This report is preliminary only. It should be reviewed by the Planning Commission and the Department of Public Works. If these bodies concur in the recommendations, with or without modifications, made herein it is desirable that further studies be made by the Department of Public Works to the end that, when the time comes for construction, it will not be found that the cost has been greatly increased by improvement on property that will be required.

Acknowledgment is made to the City Planning Commission, the Department of Public Works and all others who have furnished advice and information

[illegible] that future development in Disneyworld is more long-term [illegible] operations, it is anticipated that the average number of visitors on overall portions of the Disneyland Resort could reach [illegible] in 1990 and [illegible], or its equivalent, in 2000.

The proposed Project would have three traffic lanes in each direction. As mentioned two-lane shoulder on each is recommended for construction [illegible]. Most of the studies involved are along adjacent existing [illegible]. In order to interface as [illegible] as possible with existing [illegible], grade separations with [illegible] recommended to [illegible] the [illegible] locations.

There are differences of opinion among highway engineers whether [illegible] should be designed to carry heavy trucks or to accommodate passenger cars only. In this case, since the Project will serve industrial areas largely, therefore additional consideration should be given to heavy truck traffic.

Construction of this project through development would be accomplished by the [illegible] as follows:

Project access to Ferry Building	[illegible]
Ferry Building to Pine Street	[illegible]
Pine Street to Bay Street	[illegible]
Bay Street to Grove Street	[illegible]
Grove Street to Fifth Street	[illegible]
Fifth Street to Octavia	[illegible]
Octavia Street to Laguna Street	[illegible]
Laguna Street to Van Ness Avenue	[illegible]
Van Ness Avenue to Gough Street	[illegible]
Gough Street to Franklin Street	[illegible]
Franklin Street to Gough Street	[illegible]
Gough Street to Van Ness Avenue	[illegible]
Van Ness Avenue to Laguna Street	[illegible]
Laguna Street to Octavia Street	[illegible]
Octavia Street to Fifth Street	[illegible]
Fifth Street to Grove Street	[illegible]
Grove Street to Bay Street	[illegible]
Bay Street to Pine Street	[illegible]
Pine Street to Ferry Building	[illegible]
Ferry Building to Project access	[illegible]
Total	[illegible]

Freeway offers the only solution in view of the transportation problems with which all major cities are faced. The most practicable solution to their financial problems appears to be in the operation of the Public Use. There is the possibility of Federal aid through the Full Employment Bill and Interstate measures. Cities should have plans and specifications in advance to take advantage of any Federal aid for these worthwhile five road projects.

This report is preliminary only. It should be reviewed by the Planning Commission and the Department of Public Works. If these bodies approve in its recommendations, and if citizens' committees, once formed, it is feasible that further studies be made by the Department of Public Works in the end that, when the time comes for construction, it will not be found that the work has been greatly increased by [illegible] or property that will be required.

Acknowledgment is made to the City Planning Commission, the Department of Public Works and all others who have furnished advice and information.

during the preparation of this report.

Based on the information summarized above and given more in detail in the report our opinions are:

1. The Marginal Freeway along the route above described will prove essential as a major transportation artery in San Francisco.

2. It is not necessary that the entire project be constructed at one time. The probable sequence, based on need, should be as follows:

   a. Third and Mariposa to south end of Embarcadero.

   b. Embarcadero Viaduct.

   c. Franklin Street to Embarcadero.

   d. Bayshore Freeway to Islais Creek. This section is intimately connected with the Tideland Reclamation project.

   e. Islais Creek to Third and Mariposa.

3. To avoid undue concentrations of traffic, the Sixth Street Viaduct, between Third and Brannan Streets, should not be constructed. That section of the Marginal Freeway crossing China Basin to the south end of the Embarcadero should be built in lieu thereof.

4. Broadway, between Van Ness Avenue and the Embarcadero should be designated as a major street on the Master Plan and the Broadway Tunnel constructed.

during the presentation of this report.

based on the information presented above and given here to direct is the report for publication with:

1. The Regional Planning Staff for their valuable assistance in compiling the material for presentation.

2. The Regional Planning Commission for its cooperation.

3. The Regional Planning Staff for their valuable assistance in compiling the material for presentation.

4. The Regional Planning Commission for its cooperation.

5. The Regional Planning Staff for their valuable assistance in compiling the material for presentation.

6. The Regional Planning Commission for its cooperation.

7. The Regional Planning Staff for their valuable assistance in compiling the material for presentation.

8. The Regional Planning Commission for its cooperation.

9. The Regional Planning Staff for their valuable assistance in compiling the material for presentation.

10. The Regional Planning Commission for its cooperation.

THE MARGINAL FREEWAY

I. INTRODUCTION - SCOPE OF REPORT

San Francisco is, to a greater extent than any other city in the United States, a terminus of traffic rather than an intermediate point on a thoroughfare. The location of the mercantile and financial centers at the corner of the Peninsula accentuates this condition. Traffic enters San Francisco from the south, east and north, a major percentage thereof being destined to the Central Business District. To this traffic is added that originating in the outlying areas of San Francisco. The combination reaches the Central Business District in such volume that the existing facilities are unable to meet the demand.

Under present conditions, considering the prohibition of civilian traffic on the Embarcadero as a war-time emergency only, it is possible to save travel time and avoid congestion by using routes near the waterfront, e.g., Third Street, the Embarcadero and Bay Street. It is evident that the improvement of this route would materially increase its use, thereby removing traffic from the more congested streets.

At the present time there are no large areas in San Francisco available for industrial development. There are two large tideland areas along the Bay in the southern part of the city suitable for economical reclamation. The value of these areas would be materially enhanced by adequate transportation facilities.

It is for these reasons that all those who have made a comprehensive study of vehicular facilities in San Francisco have concluded that a major boulevard along the waterfront is essential. Accordingly the City Planning Commission requested their consultants to prepare a report on this project covering:

a. Location.
b. Foundation Conditions.
c. Number of Traffic Lanes.
d. Type of Construction.
e. Estimated Cost of Construction and Property.

Throughout this report, the term " Marginal Freeway" will be used. This should not be interpreted as expressing the idea that the original construction for the entire route should be a freeway, nor that the construction of the entire route is required in the immediate future. As will be developed later herein, the project lends itself to "stage" construction.

THE CENTRAL CORRIDOR

I. INTRODUCTION - NEED FOR STUDY

The Franklin Co., is a greater economic area than any exists only in the United States, a hundred of traffic volume than is interwoven point or a thoroughfare. The location of the universities and financial centers at the corner of the Peninsula overlooking this country. Traffic moving San Francisco from the south, must use both, a major gateway thereof being confined to the Central Business District. To this traffic is added that originating in the central area of San Francisco. The concentration reaches the Central Business District in such volume that the existing facilities are unable to meet the demand.

Under present conditions, considering the prohibition of crossing Market on the Embarcadero at a non-time controlled only, it is possible to move toward time and avoid congestion by using routes near the waterfront, i.e., Third Street, the Embarcadero and Bay Street. It is evident that the improvement of this route would materially increase its use, thereby overflowing traffic from the more congested streets.

At the present time there are no large areas in San Francisco available for industrial development. There are two large individual areas along the Bay in the southern part of the city available for accommodation of industries. The value of these areas would be materially enhanced by adequate transportation facilities.

It is for these reasons that all those who have made a conservative study of industrial facilities in San Francisco have concluded that a major development along the waterfront is essential. Accordingly the City Planning Commission recommended that measures to improve a traffic be taken at an early date.

a. Location.
b. Feasibility Considerations.
c. Volume of Traffic Lanes.
d. Type of Construction.
e. Estimated Cost of Construction and Property.

Throughout this report, the term " Regional Freeway" will be used. This should not be interpreted as expressing the idea that the regional expression for the entire route should be a freeway, but that the principal part of the entire route is designed to the freeway type. It will be developed later herein, the project lends itself to "stage" construction.

The construction of certain parts will prove desirable at an early date to relieve existing traffic congestion. Other sections fit with the plans for tideland reclamation and should be constructed as a part of such projects. In our opinion, freeway characteristics will eventually be required for the entire route. Planning for such construction should start now especially to the extent that the prospective right of way is kept clear of major improvements.

The limitations of this report should be emphasized. While some preliminary layouts of various structures have been made, this has been done only for the purpose of establishing the approximate quantities involved for purposes of cost estimates. Several of the connections to the existing or proposed streets will be complicated. Detail layouts and designs of these connections would be desirable. While it is our opinion that the general location recommended herein is the most suitable, it may be possible to reduce the cost by slight modifications. The location and details of the supporting structures over and along property under the jurisdiction of the State Harbor Commission will require considerable discussionwith the Commission and its engineers.

It has been the aim during the preparation of this report to develop facts and present them in such a manner that the City Planning Commission would have definite information on which to base their decisions. In the majority of cases, possibly to a greater extent than desirable, we have made certain recommendations. These recommendations should be considered subject to the review of the City Planning Commission and the City Department of Public Works.

The construction of central city will cause destruction to many old
to relieve existing traffic congestion. Other solutions (if with the
plans for bilateral relationship and about to — construction of a part of road
projects. In our opinion, freeway alternatives will eventually be re-
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now especially in the extent that are permanent right of way is kept
clear of major improvements.

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posed streets will be employed. Detail layouts and design of these sec-
sections would be desirable. While it is not feasible to be
sections recommended herein is the most economic, it may be possible to re-
duce the cost by slight modifications. The location and widths of the ap-
proach structures over and along properly main the feasibility of the
whole Inner Circulator will improve considerably the con-
venience and its regulators.

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and present them in such a manner that the City Planning Commission would
have definite information on which to base their decisions. In the majority
of cases, possible to a precise opinion than positively, we have made certain
recommendations. These recommendations should be considered subject to
the review of the City Planning Commission and the City Department of Public
Works.

II. ASSUMPTIONS - GENERAL CONSIDERATIONS

In any investigation of this nature, it is necessary to consider the effect of probable future developments as well as conditions as they presently exist. Among these assumptions are the following:

A. THE BAYSHORE FREEWAY

The State Highway Department has, with the concurrence of the City and County of San Francisco, established a location for the Bayshore Freeway, and plans the construction thereof at an early date. This location crosses the southern County Line at the shore line of the Bay; thence to the intersection of Third Street and Bayshore Boulevard; thence parallel to Bayshore Boulevard and Potrero Avenue to a connection with the Bay Bridge at its Fifth Street Plaza. Connections with the existing streets are proposed at Third Street, Silver Avenue, Alemany Boulevard, Army Street, Division Street, Seventh Street and Fourth Street. As will be noted in more detail below, the Public Works Department is developing plans for the following connections.

1. Division Street connecting with an improved route to the Sunset District.

2. An elevated viaduct from Sixth and Harrison Streets parallel to Sixth Street terminating approximately at Mason and O'Farrell Streets.

3. Improvements of existing streets, New Montgomery and Second, to furnish good connections between Third and Harrison and the financial district.

The construction of the Bayshore Freeway will have effects similar to those of the Bay Bridge. It will reduce travel time not only from the Peninsula but also from the southern and southwestern parts of the city. It presents, to the City Planning Commission and the Department of Public Works, the problem of distributing the large volume of traffic arriving at the Sixth and Harrison Street Interchange destined to the Central Business District.

For the purposes of the present investigation it will be assumed that the Bayshore Freeway will be completed by 1950 and that the connections above described are also constructed within the next few years.

B. THE BROADWAY TUNNEL

The Broadway Tunnel under Russian Hill has been under consideration for many years. It is herein recommended that the City Planning Commission adopt Broadway as a major street between Van Ness Avenue and

[illegible] [illegible] [illegible] [

the Embarcadero. This involves a tunnel through Russian Hill. The length of this tunnel and, consequently, the cost of the project depends on the approach grades selected. This matter is outside the scope of this investigation.

C. SECOND BAY BRIDGE

The San Francisco--Oakland Bay Bridge is rapidly approaching its traffic capacity. The construction of a second Bay Bridge may be expected within a very few years. The present bridge has had a marked effect on traffic in San Francisco; the effects of a second, especially on a thoroughfare along the waterfront, would be comparable. The initiation of investigations for this project is before the California Toll Bridge Authority. A determination of the location of its San Francisco approaches would be helpful in planning not only the Marginal Freeway, but all vehicular facilities throughout the city.

D. GOLDEN GATE BRIDGE

The obligations outstanding on this structure are a liability of the city. It is therefore good city policy to do as much as practicable to encourage traffic across this bridge by improving means of access thereto.

E. THIRD STREET

Third Street has recently been improved between the Channel and Islais Creek so as to provide three traffic lanes in either direction, except at the Islais Creek Bridge, which is scheduled for early rebuilding to provide equal capacity.

The number of intersection streets is comparatively small, so that this portion of Third Street has a capacity of 45,000 cars daily. The present "normal" traffic on this street is about 20,000 cars daily, so that there is reserve capacity ample for several years inthe future. There is considerable congestion at the north end of the Third Street Bridge over the Channel. The relief of this congestion is the principal reason for proposing the Sixth Street Viaduct.

F. FINANCIAL

The various proposals submitted to the Mayor's Citizens' Committee demonstrate that, at best, San Francisco is faced with spending immense sums for various improvements. The need for keeping the tax rates at a moderate level is recognized. This leads to certain conclusions:

the Embarcadero. This two-lane 1 tunnel through Telegraph Hill. The length of this tunnel and, consequently, the cost of the project depends on the approach grades selected. This matter is mainly the cause of this investigation.

E. BRIDGE PLAZA DESIGN

The San Francisco-Oakland Bay Bridge is rapidly approaching its traffic capacity. The construction of a second Bay Bridge may be expected within a very few years. The present bridge has had a marked effect on traffic in San Francisco; the effects of a second, especially on a downtown along the waterfront, would be appreciable. The initiation of investigations for this project is before the California Toll Bridge Authority. A determination of the location of its San Francisco approaches would be helpful in planning not only the terminal freeway, but all waterfront facilities thereafter the city.

I. OTHER CITY BRIDGE

The obligations enumerated on this structure are a liability to the city. It is therefore good city policy to do as much as practicable to encourage traffic across this bridge by increasing means of access thereto.

J. CIVIC CENTER

Civic Center has recently been improved between the Concord and Juliet Creek so as to provide three traffic lanes in either direction, except at the Inland Creek bridge, which is scheduled for early reconstruction by providing equal capacity.

The problem of intersection adjacent to Civic Center, on that side portion of Civic Center has a capacity of 45,000 cars daily. The present "normal" traffic on this street is about 34,000 cars daily, so that there is reserve capacity only for several years longer before further improvements are necessary. There is considerable congestion at the south end of the Civic Center where the Concord. The widening of this approach is the principal reason for incorporating the Civic Center project.

K. FINANCIAL

The various proposals mentioned in the Mayor's Citizens' Committee Report, as well, Don Francisco is faced with spending immense sums for various improvements. The need for handling the traffic at a moderate level is recognized. This leads to careful consideration

(a) In many cases, the extent of construction must be determined on the basis of the least expense to "get by" rather than on that which would be desirable.

(b) Sufficient study must be given any proposal to insure that the construction of the facility does not introduce complications which will entail the necessity of other expensive improvements, unless such effects are clearly indicated in the original investigation.

(c) The Planning Commission recognizes the need for improved transit facilities. Preference should be given those improvements which also include possibilities for better mass transportation.

(a) In many cases, the extent of construction work is determined by the depth of the local sewers to "pipe up" bottom then no fuel tanks would be desirable.

(b) Definition study must be given any proposal to insure that the construction of the facility does not introduce objectionable which would the necessity of other expensive improvements, unless such efforts are clearly justified in the original investigation.

(c) The Planning Commission recognizes the need for improved transit facilities. Preference should be given those improvements which also include possibility for pedestrian movement.

III. RECOMMENDED AND ALTERNATE LOCATIONS

All those who have made thorough studies of traffic in San Francisco concluded that a major traffic artery along the waterfront is an essential part of this development of San Francisco's traffic distribution. In fact, several components of the Marginal Freeway as herein recommended, the Embarcadero Viaduct and the Lombard Street Tunnel have been proposed several times by the City Department of Public Works; Third Street, which will serve as part of the recommended route until it reaches its capacity has already been widened so as to provide three traffic lanes in each direction and, for part of its length, repaved with a median strip. These proposals were coordinated and the whole presented in a comprehensive plan by the Report on Shoreline Development of the City Planning Commission of September 1943.

The route herein recommended for the Marginal Freeway, its connections and the various types of construction are shown on Drawings 1 and 6-11, inclusive. It is listed by its component parts on Table VII-6. Briefly described, it starts at Franklin and Lombard Streets, the latter being the main approach to the Golden Gate Bridge and the Marina, passes through a tunnel under Russian Hill to Columbus and Bay; thence a viaduct along Bay Street to the Embarcadero; a viaduct the entire length of the Embarcadero; a crossing over the mouth of China Basin; thence to Third and Sixteenth Street crossing Third Street to Twentieth and Tennessee Streets; thence along Tennessee Street to Islais Creek; thence along Arthur Avenue to Fitch Street; thence along Fitch Street to the County Line and a connection with the Bayshore Freeway.

Before recommending this location, consideration was given to several alternate locations as indicated on the drawings. The reasons for preferring the recommended route are given in some detail below.

Alternate A - Broadway

With the Broadway Tunnel proposed by the Department of Public Works, it seemed desirable to consider this as a part of the Marginal Freeway. This possibility was abandoned for the following reasons:

1. A four-lane tunnel on Broadway will be used to its capacity within a very short time after its completion by strictly local traffic. It will serve the Pacific Heights District, and will divert traffic now using all streets as far south as Geary destined to the North Beach Area. Until the Lombard Street Tunnel is constructed, it will be an improvement over the present facilities for traffic from the Golden Gate Bridge and the Marina destined to the Central Business District. It is probable that the capacity of the Broadway Tunnel and that of Columbus

III. [illegible]

[illegible]

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Avenue and Stockton Street will be reached at about the same time. All studies lead to the conclusion that, as a means of reducing congestion, every possible inducement must be given traffic to select a circumferential route some distance removed from the Central Business District.

2. This proposal would involve the following construction:

   a. Six-lane construction, partly in tunnel and partly on viaduct from Lombard and Gough to the tunnel entrance on Broadway between Polk and Larkin.

   b. An elevated viaduct on Broadway from Mason to the Embarcadero

   The above construction would entail considerably more property damage than does the recommended route.

Alternate D - Bay Street

Because of the high cost of tunnel construction, consideration has been given to the proposal of moving the location of the Marginal Freeway four blocks north. Bay Street is one of the principal connections to the Marina and the Golden Gate Bridge. Between Fillmore and Laguna Streets, Bay Street is 100 feet wide with 80 feet between curbs. At Laguna Street, it narrows to 68.12 feet with 55 feet between curbs, there being no sidewalk on the north side of the street. East of Van Ness Avenue, the street is 68.75 feet wide. The sidewalks have been narrowed to 8 feet, leaving 52.75 feet between curbs. The grades on Bay Street, ascending westward, between Columbus and Leaven worth and Leavenworth and Hyde are respectively 18 and 8 per cent. The former grade is too steep to be conveniently negotiated by trucks with the result that most of the heavy commercial traffic detours a block further north to North Point Street. The grades on this latter route, 8 per cent between Leavenworth and Hyde and 9 per cent on Van Ness between Bay and North Point, are still higher than desirable for truck traffic.

The proposal hereinconsidered involves the following construction (see Drawings 6 and 7).

1. The widening of Bay Street to 100 feet between Laguna and Franklin.

2. A tunnel plaza between Franklin and Van Ness Avenue. It will be noted that because of Gallileo High School and the Athletic Field, it becomes impracticable to provide a direct connection with Van Ness Avenue.

3. A tunnel from the west side of Van Ness Avenue to the east side of Polk Street, south of North Point Street.

4. An open cut with retaining walls along the south side of North Point Street from Polk to Columbus.

5. A viaduct from Columbus Avenue to the Embarcadero. For purposes of comparison with the Lombard Street estimates, this viaduct has been carried to Filbert Street.

The estimated cost of the project follows.

	Lin. Ft.	Construction	Property	Total
Street Widening Laguna to Franklin		$ 55,000	$ 520,000	$ 575,000
Tunnel Plaza Franklin to Van Ness	330	55,000	180,000	235,000
Tunnel Van Ness to Polk	760	1,100,000	-	1,100,000
Cut and Retaining Walls Polk to Leavenworth	1,390	1,600,000	360,000	1,960,000
Viaduct Leavenworth to Embarcadero	5,890	3,000,000	1,050,000	4,050,000
Total	8,370	$5,810,000	$2,110,000	$7,920,000

The estimated costs of this construction are nearly as great as those for the recommended location. For the reasons given below, this proposal is much less desirable.

a. The widening of Bay Street, west of Van Ness Avenue, would require the demolition of expensive property.

b. Trucks from the Marine and the Golden Gate Bridge would be required to turn left at Franklin and Lombard Streets to the tunnel entrance. For this reason, the route would attract very few additional trucks, and would not reduce the amount of trucking on Van Ness Avenue.

c. The plan does not provide a satisfactory connection with Van Ness Avenue.

Alternates B and C

The above considerations lead to the conclusion that the Freeway should form a reasonably direct prolongation of the Lombard Street approach to the Marina and the Golden Gate Bridge. Alternate B provides the most

4. As above but with retaining walls along the south side of Tenth Street from 7th to Colombo.

5. A station like Gallatin instead of the Bloomsbury. Site questions of convenience with the Central Station Relation, this station has been omitted in Plan I above.

The estimated cost of the various plans follows.

	Acres	Construction	Property	Total
Street Widening				
Lagoon to Franklin	[illegible]	[illegible]	[illegible]	[illegible]
Tunnel Plan:				
Franklin to Fox Moss	[illegible]	[illegible]	[illegible]	[illegible]
Tunnel				
The Loop to 11th	[illegible]	[illegible]	-	[illegible]
Car and Pedestrian Tube:				
Tube to Lagoonend	[illegible]	[illegible]	[illegible]	[illegible]
Viaduct				
Lagoonend to Delaware	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]

The estimated costs of these constructions are roughly as shown for the Pennsylvania location. For the reasons given below, this proposal is much less desirable.

a. The widening of any street, even of two lane traffic, would require the demolition of extensive property.

b. Through traffic for Chicago and the Loop District would be required to turn left at Franklin and Jackson Streets to reach Halsted. For this reason, the route would inherit many the undesired traffic, and would not relieve the present congestion on Van Buren Avenue.

c. The plan does not provide a satisfactory connection with the Dan Avenue.

Alternate 1 and 2

The above considerations lead to the conclusion that the tracks should have a reasonably direct application of the limited travel expected in the Loop and the Clinton Gate Station. Alternate 3 provides the most

direct route but involves a second tunnel under Telegraph Hill. To avoid this tunnel, Location C turning north to Francisco Street so as to pass north of Telegraph Hill was considered. This furnishes an excellent route; unfortunately, to secure a good alignment, it involves acquisition of expensive warehouse property between Montgomery Street and the Embarcadero.

The comparison of estimated cost for the three proposals is given by the following tabulation.

Alternate B

Six-lane Freeway - Lombard Street - Total Length 7,590 feet

	Estimated Cost		
	Construction	Property	Total
Tunnel and Approaches Franklin to Columbus	$4,400,000	$600,000	$5,000,000
Columbus Avenue Viaduct Columbus to Stockton	600,000	1,000,000	1,600,000
Tunnel Stockton to Montgomery	2,300,000	-	2,300,000
Viaduct and Connections Montgomery to Embarcadero and Filbert	1,450,000	950,000	2,400,000
Total	$8,750,000	$2,550,000	$11,300,000

Alternate C

Six-lane Freeway - Lombard - Francisco - Total Length 7,890 feet

	Estimated Cost		
	Construction	Property	Total
Tunnel and Approaches Franklin to Columbus	$4,900,000	$575,000	$5,475,000
Viaduct Columbus to Stockton	1,100,000	550,000	1,650,000
Cut and Paving Stockton to Kearny	250,000	720,000	970,000
Viaduct and Connections Kearny to Embarcadero and Filbert	1,600,000	980,000	2,580,000
Total	$7,850,000	$2,825,000	$10,675,000

Recommended Location

Six-lane Freeway - Lombard - Bay - Total Length 8,400 feet

	Estimated Cost		
	Construction	Property	Total
Tunnel and Approaches Franklin to Columbus	$4,345,000	$575,000	$4,920,000
Viaduct and Connections Columbus to Embarcadero and Filbert	2,970,000	790,000	3,760,000
Total	$7,315,000	$1,365,000	$8,680,000

Discussing the three alternates:

The direct route, Alternate B, along Lombard Street appears a natural selection. However, both from the standpoints of cost of construction and operation of the ventilating machinery, it is desirable to eliminate the tunnel under Russian Hill.

As between the Francisco and Bay Streets routes the latter appears preferable in that the costs of property acquisition are much less. East of Columbus Avenue, Bay Street is entirely commercial so that there would be little objection to an elevated viaduct in the street.

The Lombard-Bay Streets location has the further advantage that it is well suited to a "stage" construction program. East of Columbus, Bay Street has capacity for considerable additional traffic. The traffic on intersecting streets is comparatively small. By widening to 100 feet between Columbus and Grant, construction at street grade might meet all requirements for many years.

In view of the above, the Lombard-Bay Street route is recommended for the Marginal Freeway.

For that section of the Freeway between Bay and Bryant Streets, there appears no question but that the Freeway should be constructed as a viaduct on the Embarcadero. In fact, any other location would involve the acquisition of so much industrial property as to render the cost of the project prohibitive.

The best location for the Marginal Freeway between 20th Street and Bryant Street presents several difficulties. The Public Works Department has proposed the Sixth Street Viaduct, extending from Third and Mariposa to Sixth and Brannan. This latter proposal primarily is for the purpose of

Incremental Costing

Skyline Towers - Indirect - Dec. - Total Costs & Per Unit

	Estimated Unit Construction Increase	Total
Travel and Expenses Payable to Salaries	$4,340,000 $177,000	$4,520,000
Rental and Depreciation Expenses to Structures and Fixtures	2,970,000 770,000	3,740,000
Total	$7,310,000 $1,340,000	$8,260,000

Discussing the three alternatives

The first study, Alternate B, alone, indeed first would require a reduced duration. However, both first the elimination of most of construction and operation of the ventilating machinery, it is desirable the thread under Tunnel Hill.

In Tabeau the Tunnel and Bay Streets crosses the latter system pipeline in that the ends of recently constructed are road. Each of Columbus street, Bay Street is entirely dependent so that there would little objection to an elevated viaduct in the street.

The Lookout-Bay Streets location has the further advantage that it is well suited to a "future" construction project. Plot of Columbus, Bay Street the capacity for considerable additional traffic. The traffic on intersecting streets is comparatively small. By rotating to 30 feet between Columbus and Bank, construction at first cuts right most all requirements for many years.

In view of the above, the Lookout-Bay Tunnel alone is recommended for the accepted Tunnel.

The next section of the Tunnel between Bay and Mount Streets, there appears no question but that the Tunnel should be constructed as a viaduct on the Embankment. In fact, any other location would involve the annihilation of so much industrial property as to render the cost of the project prohibitive.

The best location for the Mayfield Tunnel between 27th Street and Grand Avenue presents several difficulties. The Valley Basin Improvement Association proposes the Ninth Avenue Tunnel, connecting Penn Plaza and Lexington Heights and Grandin. This latter proposal, however, is for the purpose of

relieving the congestion at the north end of the Third Street Bridge over the Channel. The Bayshore Freeway will bring a large volume of traffic destined to the Central Business District to the intersection at Sixth and Harrison. The City Public Works Department is considering two improvements to accommodate this traffic. The first is an overhead viaduct (Drawing 1) parallel to Sixth Street with a terminus in the vicinity of Mason and O'Farrell. The second is improved connections to Second and New Montgomery Streets so as to provide adequate routes to the Financial District.

A decided advantage in locating the Marginal Freeway via Sixth Street would be the elimination of any movable span across the Channel. In their consideration of the waterfront route for the Bayshore Freeway, the State Highway Engineers considered fixed bridges over both Islais Creek and the Channel with underclearances of 135 feet above mean high water. This accounts in part for the extremely high estimates reported for this route at the recent conference between the City Planning Commission and the State Highway Engineers.

It is our opinion that, because of such high costs and resulting difficulties in making local connections, no consideration can be given to high-level bridges.

During the eight months ending April 30, 1945, there were 2,163 openings of the Third Street Bridge over the Channel and 2,248 openings of the Islais Creek Bridge, an average of nine openings of each bridge per day. The number of openings has been greatly increased by wartime conditions. Under normal conditions the average number of openings per day is approximately six for the Channel Bridge and three for the Islais Creek Bridge. Both of these bridges have been constructed with such small clearances that openings are required for craft of all descriptions. If a movable span were constructed across the mouth of China Basin with a clearance of 65 feet above mean high water (61.0 City Base), the number of openings probably would be reduced to an average of not over one per day.

A connection from the Bayshore Freeway intersection at Sixth and Harrison to the Embarcadero via Bryant Street would attract considerable traffic arriving at such intersection destined to points along the Embarcadero to the Marina and to the Golden Gate Bridge and provide an express route therefor. This would relieve to some extent the traffic on the routes above described between the Sixth and Harrison Street intersection and the Central Business District.

Accordingly three routes have been considered for the Bayshore Freeway between 19th and Tennessee Streets and Bryant Street and the Embarcadero as follows: (See Drawing 1).

I. Recommended Route via the Mouth of China Basin.

E. Via Sixth Street to the Bayshore Freeway, along the Bayshore Freeway to Third Street, thence via a tunnel and viaduct along Bryant Street to the Embarcadero.

F. Via Sixth Street to Brannan Street, thence a viaduct along Brannan Street to the Embarcadero

The decision as to which of these routes should be adopted should depend mainly on its effect on traffic conditions, the difference in cost being a secondary consideration.

Estimates of traffic and travel times via the various routes are given in some detail in Section V. In so far as this portion of the Marginal Freeway is concerned the findings of such Section may be summarized as follows:

1. Assuming Location E adopted for the Marginal Freeway, the Bayshore Freeway, because of its shorter length, has a two minute advantage between the intersectionsouth of the County Line and the intersection at Sixth and Harrison.

2. Under any circumstances there will be very heavy traffic at the Sixth Street interchange structure. The estimates of Section V indicate a total of 180,000 vehicles entering and leaving daily in 1970 under Alternate E.

3. From its location, the percentage of industrial traffic on the Marginal Freeway will be higher than average. Inso far as practicable, it would be desirable to keep this traffic away from this interchange structure.

Alternate route F was laid out so as to use the Sixth Street viaduct in order to avoid the necessity for a movable span and also to avoid the expense of the tunnel between First and Second Streets which is necessary in Route E. From a traffic standpoint, it does not appear satisfactory. A large volume of traffic would be lost at Sixth and Brannan and the route would not attract traffic from the Bayshore Freeway destined to the Embarcadero.

The estimates of cost for six-lane construction between Twenty-First and Tennessee Streets and Bryant Street for the three alternate routes are as follows:

	Construction	Property	Total
Recommended	$8,010,000	$460,000	$8,470,000
E	9,200,000	3,100,000	12,400,000
F	9,200,000	2,900,000	12,100,000

3. Transportation Study and the Growth of Urban Areas.

6. The Urban Renewal in the Carleton Township, along the Highridge Freeway to Point Edward, Ontario via a tunnel and viaduct along Front Street direct to the Expressway.

7. The Urban Renewal in Toronto itself, linked a viaduct along Jarvis Street to the Expressway.

The Township is to which it first route (Item 1) be adopted should depend mainly on the relative costs. The difference in cost being a secondary consideration.

Estimates of traffic for typical times via the various routes are given in some detail in Section V. In so far as this portion of the Highway Study is concerned the findings of such factors may be summarized as follows:

1. Assuming Location 1 selected for the Highway Freeway, the Highridge Freeway, because of its shorter length, has a two dollar advantage between the interchanges of the County line and the Intersection at Point Edward.

2. Under any circumstances there will be very heavy traffic at the Point Edward Interchange. The estimate of Section V indicates a total of 750,000 vehicles entering and leaving daily in both directions.

3. From this location, the percentage of industrial traffic to the Highridge Freeway will be fifty-five percent. From the investigation, it would be desirable to keep this traffic away from this intersection elsewhere.

Alternate route 2 was laid out so as to use the Eighth Street viaduct in order to avoid the necessity for a special span and also to avoid the expense of the Tunnel between Elgin and Lawson Streets which is necessary in Route 3. From a traffic standpoint, it does not appear satisfactory. A large volume of traffic would be lost at both ends Elgin and the route would not attract traffic from the Hamilton Freeway destined to the Intersection.

The estimates of cost for alignment between Freeway-Viaduct and Tunnelman Structure and Expwork Items for the three alignments are as follows:

Description	Freeway	Viaduct	Total
Route selected	$5,010,000	$4,480,000	$9,490,000
2	4,800,400	3,200,000	12,000,000
3	6,200,000	3,400,000	10,200,000

Certain reservations as to these estimates follow.

For the recommended location, no allowance has been made for the costs of property now under the jurisdiction of the State Harbor Commission. It is possible to lay out elevated structures that will not interfere materially with the present uses of the property. Improved access to the waterfront would be of material advantage to the Harbor Commission. Nevertheless, some uncertainty exists in this connection.

The estimates for Alternate E make no allowance for construction nor for property in the blocks between Third, Harrison, Seventh and Bryant, it being assumed that arrangements could be made with the State Highway Department to construct the interchange structures. The estimate includes the purchase of property in the block bounded by Second, Harrison, Third and Bryant Streets which will be required in case of the proposed improvements of surface routes between the interchange structure and the Financial District via Second and New Montgomery Streets.

Another location, Alternate N, has been considered but not analyzed in detail, namely, extending along Tennessee Street to Sixteenth Street; thence parallel to, and approximately 250 feet north and west of, Third and Fourth Streets to King Street; thence along King Street to the Embarcadero. This plan has not been analyzed in detail for the following reasons.

1. It interferes with many railroad facilities.

2. It does not appear wise to cross the Channel by a movable bridge when, by moving the route only 1,600 feet further west to Sixth Street, it would be possible to construct a fixed span.

For the section between Twentieth Street and Islais Creek, Alternate Locations G and H have been considered.

Alternate G contemplates an elevated viaduct above Third Street. Even after the construction of the Marginal Freeway, Third Street will be an important industrial thoroughfare. It does not appear desirable to obstruct the area of such a street with supports for an elevated structure.

Illinois Street, Location H, was rejected for the following reasons.

1. Because of the State Grain Terminal, it would be necessary, at the southerly end of this location, to bear to the east and cross Islais Creek at Maryland Street. This location is too far from Third Street to afford a good connection therewith. Such a connection is considered essential.

Section numbering as in three articles follows.

For the procedural Invalid, no alignment has been made for the
media of privacy due under the Northeastern of the Civic Service Com-
missions. It is possible to log out already otherwise that will not
interfere actually till the present time of the recovery. Proposed
courses to the watchtrack would to of natural alternative to the Tyrian
Constitution. Nevertheless, some uncertainty exists in their enactment.

The methodes for literacy I take no difference for abandonment are
the property in the Negro Veterans Board, Secretary, Jewish and Israel,
it being without this proportionate result was with the in to destroy
department to construct the Intermediate electrons. The artificial in-
cluding the revolution of property in the Black required by lawful, Inter-
nal, Social and Import Library which will be produced in case of the
previous Interpretation of medicine product between the Intermediate Union-
type and the financial Scientist via Second as the Tuskegee District.

Another Inactive, Alternate B, has been dramatized but not realized in
detail, briefly, in putting close conveyance thence to statement Attempt
Change cancelled to, and accordingly CCC Post Profit and Work of, Third
and Fourth Fifth to stop Church! Change other that Attempt to use Con-
tinental. This plan has not been analyzed in detail for the following
reasons.

1. It behaviors with poor Political Position.

2. It does not appear wise to crowd the Quadrant by a possible
   Voting Area, by moving the range only 1,000 feet further
   west to Cloud Street, it would be possible to construct
   a fixed area.

For the section between Twenty-seven and Sixty Three, Alternate
Locations B and C have been considered.

Alternate C contemplates an elevated viaduct along Third Street. Upon
which the construction of the Twelfth Freeway, Tunnel Ramps will be
an important Industrial Characteristic. It does not appear desirable
to distract the area of road a street with accounts for an elevated
structure.

Fifteenth Street, Location B, was rejected for the following reasons.

1. Because of the Civic Auto Traffic, it would be necessary,
   at the southerly end of this Junction, to have to the east
   and across Third at Bigpool Street. This Junction is
   too Five Year Plans Street to allow a good connection with-
   out. And a connection is unsatisfactory.

2. The viaduct would be located over railroad tracks on which switching is continually in progress. To afford the necessary clearances, the viaduct would have to be of steel construction. The maintenance cost would be very high.

However, as a part of this section of the Marginal Freeway, it is recommended that the City Planning Commission request the Department of Public Works to investigate the advisability of reconstructing the Third Street Bridge over Islais Creek, Alternate M, in such a manner that an upper deck could be added now or later to accommodate the Marginal Freeway at a later date. The reasons for this recommendation are as follows:

1. It is our opinion that this section of the Marginal Freeway will be required in less than twenty years. If the Hunters Point Navy Yard develops as anticipated and there is any considerable reclamation of the tidelands, some grade separation structure at the intersection of Third Street and Arthur Avenue may prove necessary long before that time.

2. The additional cost to provide for the second deck would be comparatively small.

3. The combined bridge would interfere less with available berthing space along Islais Creek than would two bridges.

At the southerly end of the route, it would be possible to improve the alignment to some extent by tunnels at Hunters Point and Candlestick Point, Alternates K and L, rather than by the cuts involved in the recommended location. The cuts are more economical and the proposed alignment satisfactory so that there appears little reason for considering tunnels.

Consideration was also given to the possibility of connecting the Marginal Freeway to the Bayshore near the Third Street and Bayshore Boulevard and from such intersection acquiring property west of Third Street to Islais Creek. This involves expensive property and increased construction costs and does not provide for the development of the Tidelands to be reclaimed to an extent comparable with the recommended location.

IV. FOUNDATION CONDITIONS

The rocky hills of San Francisco are a well-known feature of this city. Between these hills are deep canyons. For example, under the Central Business District, bed rock dips from the continuation of Russian Hill to a depth of 290 feet at Mission Street and thence rises to the slope of Rincon Hill. Over the ages, these valleys have become filled with sand blown from the dunes near the ocean waterfront and with alluvial deposits. Along the western front of the Bay, the work of nature has been supplemented by that of man in reclaiming the tidelands. Many of the alluvial deposits overlying the rock, by their nature or by consolidation over the ages are capable of sustaining heavy loads, although in many cases it is necessary to go, by means of piles or caissons, to considerable depths to find such strata. Fortunately, records are available that give such depths in sufficient accuracy to permit making preliminary designs and estimates.

Drawing 2 shows approximately the "Contours of Hard Bottom", i.e., the depths to which foundations must be carried by piles or caissons to insure against material settlements. As an example, the drawings indicate that, at the Ferry Building, piles approximately 150 feet long might be required. Again, as might be anticipated, the depth to solid bearing are very considerable at the Channel and at Islais Creek.

The depths indicated are, in general, considerably greater than those to which piles have been driven in supporting waterfront structures. These structures, with shorter piles, have not settled to any great extent. The distinction is between "friction" piles in which the load is distributed to the surrounding soil and "bearing" piles in which the load is assumed distributed over firmer strata at the tips of the piles. In the case of heavy buildings with a considerable load over large areas, e.g., P. G. & E., Matson and Southern Pacific buildings, the transfer of the loads to the compacted strata is essential. Where smaller areas, as would be the case with the viaduct foundations, "friction" piles might prove satisfactory. As a preliminary to a final design, borings and tests of the samples obtained therefrom would be advisable. In the meantime, the estimates have been based on the longer piles.

A similar question arises in connection with the fills, on which roadways at grade are proposed along the tidelands south of Islais Creek. The upper strata of these tidelands consist of mud. If it were required to construct a roadway that would not settle, it would be necessary to remove this mud and backfill with sand or similar material. This is an expensive procedure which, in our opinion, is not justified. It is proposed, in construction, to displace the softer mud by starting the fill at the shore line and to compact the underlying soil by the upper fill. It is recognized that the roadway, built in this way, will settle and will require raising from time to time.

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V. TRAFFIC ESTIMATES - TRAVEL TIMES

One of the first requirements in planning any vehicular facility is to estimate the traffic which will be accommodated thereby. In the case of the Marginal Freeway, traffic will vary at different points along the route. Hence estimates of the traffic at such various points and of the volume at the various connections are required.

Rather complete data as to traffic are available. The following sources have been consulted:

1. A Report on the San Francisco Citywide Traffic Survey - Miller McClintock, 1937.

2. Counts by State Highway Department - 1943.

3. Traffic Records - San Francisco-Oakland Bay Bridge.

4. Traffic Records - Golden Gate Bridge.

The estimates of traffic derived below are based on several assumptions, as follows:

1. That in the following 20 years there will be considerable increase in both population and industrial activity in the entire Bay Region as compared to the pre-war period and that automobile registration and use will coincide therewith.

2. That parking space in or conveniently adjacent to the Central Business District will be made available at a reasonable cost to those requiring such facilities.

3. That there will be no marked reversal of the trend from mass transportation facilities to the private automobile, at least from the outlying districts.

4. That there is no revolutionary change, for example, use of airplanes for short trips, from the presently accepted methods of transportation.

In some of the traffic estimates which follow forecasts have been made 25 years into the future or to 1970. In view of the above assumptions, these estimates are not given with any idea that they are accurate. In this particular case the need for the southern portionof the Marginal Freeway will not become apparent until after the Bayshore Freeway reaches its capacity under comfortable driving conditions. To a lesser degree the conditions at the northern end of the route are comparable. The

I. Traffic Estimates - Basic Data

One of the first investments in planning any metropolis locality is to estimate the traffic which will be encountered thereby. In the case of the Capital District, traffic will vary at different points along the route. Hence estimates of the traffic at each various points and of the volume at the various crossings are required.

Earlier economic data as to traffic are available. The following sources have been consulted:

1. A Report on the San Francisco Bridge Traffic Survey - William Hoffstadt, 1927.

2. Courts in State Highway Department - 1925.

3. Traffic Records - San Francisco-Oakland Bay Bridge.

4. Traffic Records - Golden Gate Bridge.

The estimates of traffic derived below are based on surveyed observations, as follows:

1. That in the following 20 years there will be considerable increase in both population and industrial activity in the entire Bay Region as compared to the pre-war period and that such prosperity and use will continue throughout.

2. That parking space in or conveniently adjacent to the Central Business District will be made available by a reasonable cost to those requiring such facilities.

3. That there will be no undue reversal of the trend from cheap transportation facilities to the private automobile. At least from the available statistics.

4. That there is no revolutionary change, for example, use of airplanes for short trips, from the presently accepted methods of transportation.

In view of the traffic estimates which follow forecasts have been made 25 years into the future or to 1970. In view of the above assumptions, these estimates are not given with any idea that they are accurate. In this particular case the need for the ensuing portrayal the Municipal Improvement will not become adjusted for the Bayshore Freeway traffic capacity under comfortable driving conditions. To a large degree the conditions at the approaches and of the route are controlling. The

need for the Freeway will not become urgent until after Broadway, Columbus Avenue and Stockton Street have reached their capacity. For these reasons it appears desirable to give our best estimate of traffic over the longer period.

To as large an extent as possible, the effects of wartime conditions have been disregarded. Automobile traffic has been increased over normal by accelerated wartime activity and the marked increase of population in the Bay Area; it has been held down by gas rationing and other wartime restrictions. We have analyzed available data in these respects and conclude that the effects of increased business activity and of wartime restrictions practically offset each other. The increases in traffic correspond very closely to what might have been anticipated onthe basis of the increased population.

In this respect, however, the McClintock counts were taken in 1937. At such time, vehicular traffic had not recovered from the depression. We believe the McClintock counts may be considered five per cent below normal for that date.

Statistics and estimates of population for San Francisco and the contiguous counties are given by the following tabulations.

County	Population Apr. 1930 (a)	Apr.1940 (a)	Nov.1943 (b)	% Increase 1930-1940	% Increase Apr.1940-Nov.1943
Alameda	474,883	513,011	661,955	8.3	29.0
Contra Costa	78,608	100,450	227,810	27.9	126.8
Marin	41,648	52,907	71,275	27.2	34.7
San Francisco	634,394	634,536	737,154	0.0	16.2
San Mateo	77,405	111,782	145,620	44.7	30.3

(a) United States Census

(b) "How Many Californians" - California State Reconstruction and Re-employment Commission, July 1944.

How much of this increase will be retained permanently is a matter of considerable speculation and depends very largely on the local postwar industrial development. It appears the general opinion of those who have studied the matter that, while there may be some drop after the war, the 1943 population and corresponding traffic may be equalled by 1950. Major population increases may be anticipated in San Mateo and Santa Clara Counties. The anticipated development of the San Francisco Airport will result in large volumes of vehicular traffic.

County	Population Apr. 1, 1970 (a)	Apr. 1980 (a)	Nov. 1982 (b)	% Increase 1980-1982	% Increase Apr. 1970-Nov. 1982
Alameda	1,073,184	1,105,379	1,121,170	1.4	4.5
Contra Costa	558,389	656,380	667,450	1.7	19.5
Marin	206,038	222,568	224,909	1.1	9.1
San Francisco	715,674	678,974	678,974	0.0	-5.1
San Mateo	556,234	587,329	592,043	0.8	6.4

(a) United States Census.

(b) "The Easy Decision" - California State Conservation and Development Committee, May 1983.

The rest of this increase will be natural population in a matter of normal-rate especially the old towards very large on the Inner Harbor industrial development. It appears the general opinion of those who have studied the matter that, while there may be some drop after the war, the 1983 population and corresponding traffic may be equalled by 1990. Beyond population increases may be anticipated in San Pablo and Suisun Bays (Solano). The anticipated development of the San Francisco Airport will result in large volumes of residual traffic.

The following assumptions will be made when using the McClintock Counts.

McClintock - 1937 Count	1.00	1.00
Add because of depression	.05	.05
	1.05	1.05
Add for increases to 1940		
Traffic originating within city	.03	
" " outside city		.06
1940 Traffic	1.08	1.11
Add for increases 1940-1943		
16% x 1.08	.17	
1943-1950 Traffic originating within city	1.25	
30% x 1.11		.34
1943-1950 Traffic originating outside city		1.45

Applying these factors to the traffic at the County Line:

Twelve-Hour Counts - 1937		
Bayshore Highway	20,064	52.3%
Junipero Serra, Mission and San Jose	18,326	47.7%
Twelve-Hour Count	38,390	
50%	19,195	
Estimated 24-hour	57,585	
	1.45	
	83,000	

The 1943 State Highway count (16 hour) at the same stations was:

Bayshore Highway	29,250	45%
Junipero Serra, Mission and San Jose	35,700	55%
Sixteen-Hour Count	67,950	
20%	13,950	
Estimated 24-hour	81,700	

It will be noted that between 1937 and 1943 there was a change in the proportion of the total traffic carried by the two gateways. This resulted from improvements made at Junipero Serra and connecting streets in the western part of the city. Upon completion of the Bayshore Freeway, the competitive position of the two gateways will again be reversed with the result that the Bayshore route will again carry considerably more than half of the total traffic.

A major improvement in transportation facilities, such as the Bayshore Freeway, invariably has two results. It diverts traffic from other means of transportation and generates new traffic. In this case, the Freeway is certain to divert passengers from the Southern Pacific Peninsular suburban service, which carries about 200,000 passengers per day. A diversion of only five per cent of these passengers, at an average of three passengers per car, would produce 3,300 vehicles daily.

The following abbreviations will be used when making the entries.

Bellbrook - 1897 Count	L.C	1.40
Add Tenants of Gilgrandale	"	"
	L.C	1.05
Add for increase to 1900		
Inglis Gardiner-Blair ship	.05	
" " widow ship	"	
1900 Survey	L.C	1.10
Add for increase 1900-1902		
1902-1908 Inglis ordinary widow ship	"	
	L.C	
1902-1908 Inglis ordinary seaman ship	"	
	L.C	

Explain these Entries in the Inglis at the County Album

Twelve-Hour Bowls - 1937

Derbyshire Scarves	20,000	20.00
Montacute Downs, Bleaden and Son Fine	21,000	21.00
Thatcombe Cleave	30,000	
Pond	15,000	
Eastwood Orchard	7,000	
"	1,000	
	94,000	

The 1843 Stella Delaney vessel (12 hour) at the main challenge

Derbyshire Scarves	20,000	20
Montacute Downs, Bleaden and Son Fine	21,000	21
Thatcombe Cleave	30,000	
Pond	15,000	
Eastwood Orchard	7,000	
"	1,000	

It will be noted that between 1937 and 1943 there was a change in the proportions of the total Inglis carried by the two partners. This resulted from improvements made at Thatcombe Downs and consequential adverse to the western part of the old. Upon dissolution of the Gardiner Property, the corporation position of the two holdings will again be reversed with the result that the Bellbrook South will again be carrying considerably more than half of the total Inglis.

A major improvement in transportation facilities, namely the Gardiner Freeway, immediately has two results. It divorces Inglis from their former use of transportation and provides new capital. In 1960 when the Gardiner is opened to divert passengers from the Bellbrook Inglis Junction, considerable activity, which carries about 20,000 passengers per day. A diversion of only five per cent of these passengers, as in addition of three passengers per car, would produce 2,000 vehicles daily.

As to new traffic generated by the improved facility, we believe 3,700 vehicles daily a conservative estimates.

Therefore, our estimate of traffic on the Bayshore Freeway at the County Line in 1950 is as follows:

Total vehicles - present facilities	85,000	
Bay Shore Route - 55%	46,750	
Less remaining on surface streets	6,750	
Freeway		40,000
Add Diversions	3,300	
Generation	3,700	7,000
Starting with this initial load		47,000

Our estimates of traffic for the various sections of the Bayshore Freeway are:

	Estimated Traffic	
	1950	1960
County Line	47,000	56,000
Third Street	-10,000	-12,000
	37,000	46,000
Silver Avenue	+ 3,000	+ 3,300
	40,000	49,300
Alemany Boulevard	+15,000	+16,500
	55,000	65,800
Army Street	- 3,000	- 3,400
	52,000	62,400
Division Street	- 7,000	- 8,000
	45,000	54,400

It will be noted that the above estimates of the Freeway traffic show net losses at Third Street, Army Street and Division Street. This is in line with the existing traffic pattern on Potrero Avenue. It is certain that, with the Freeway, the percentage of such diversions will decrease. There is a strong possibility that, in place of reductions at these points, increases will occur.

As a rough check on the estimated traffic between Army and Division Streets, the twelve-hour, 1937 count on the streets between and including Colores and Potrero at 22nd Street was:

12-hour count	66,000 vehicles
50%	33,000
Estimated 24 hour	99,000
	1.25
Estimated 1943-1950	124,000
Add diversion and generation	7,000
Estimated 1943-1950 traffic	131,000

As to new vanity announced by the Improved Fidelity, an initial 3,000 vehicles daily a construction additions.

Thereafter, our estimate of Variety on the Keystone Freeway in the County line in 1930 is as follows:

Total valuation - present facilities	$6,000
Tax Rises Quite - 10%	$ 700
Loan application on mature accounts	1,250
Treasury	$ 4,450
Add Interest on	3,000
Conversion	2,750
	5,750
Starting with this initial load	$7,000

Our estimate of traffic for the various sections of the Keystone Freeway are:

Estimated Traffic

	1930	1940
County Line	$7,000	$ 9,500
Tidal Stream	-10,000	-14,000
	17,000	23,500
Silver Lincoln	- 3,000	- 3,500
	14,000	20,000
Alameda Southgate	-3,000	-4,000
	11,000	16,000
Ridge Grove	- 3,000	- 4,000
	8,000	12,000
Division Street	- 3,000	- 4,000
	5,000	8,000

It will be noted that the above estimates of the Treasury Traffic show not inside at Tidal Stream, Ridge Grove and Division Street. This is the time with the existing horrific conditions on Keystone Avenue. It is anticipated, with the Freeway, the percentage of truck diversions will increase. There is a strong possibility that, in place of reductions as these points, increases will occur.

As a rough check on the estimated traffic between Ridge and Division Streets, the Twenty-Year, 1930 census on the streets between and including Cedros and Potrero is 32nd Streets were:

Ridge-Bayer account	$6,000 valuation -
Sup	2,000
Restricted to Time	800
	1,200
Estimated 1931-1940	1,000
Add diversion and generation	2,000
Estimated 1940-1950 traffic	3,000

The above estimate for this section of the Freeway is 52,000, or 39%, of the total traffic on these streets. The corresponding present percentage on Potrero with all streets at grade is 36.5. As stated above, it is possible that there will be an addition, rather than a loss as above estimated at Army Street. The same might prove the case at Division Street, especially if a freeway-type connection were provided from the Bayshore Freeway to the Embarcadero.

The twelve--hour count of traffic on Third Street north of Army in 1937 was 13,000 vehicles

50%	6,500
24 Hour	19,500
	1.25
Estimated 1943-1950 traffic (abt)	24,000

Similar estimates at the intersection with Bayshore Boulevard are

12 hour count (1937)	5,820
50%	2,910
24 hour	8,730
	1.25
Estimated 1943-1950 traffic (abt)	11,000

It has been estimated that the 1950 traffic on the Bayshore Freeway between Alemany Boulevard and Army Street will be 55,000 vehicles. For purposes of comparison the average traffic on the Bay Bridge in June, 1945, was 58,000, of which approximately 50,000 used the six-lane upper deck. This traffic and probably 20 per cent additional can be handled expeditiously, except at such times as a vehicle is forced to stop by a flat tire or similar reason. It is our opinion that the capacity of the Freeway may be placed at 60,000 cars daily and that this capacity will be reached by 1960. When this capacity is reached, much of the excess traffic will be forced to Third and other surface streets until the Marginal Freeway is constructed.

Assuming that both the Bayshore Freeway and the Marginal Freeway are available by 1960, our estimates of the traffic on the two routes in 1960 and 1970 are given below.

Bayshore Freeway

	Estimated Traffic 1960	1970
Brisbane	56,000	67,000
Marginal Freeway	-20,000	-33,200
	36,000	33,800
Third Street	+ 2,000	+ 2,500
	38,000	36,300
Silver Avenue	+ 3,300	+ 3,700
	41,300	40,000
Alemany Boulevard	+17,700	+20,000
	59,000	60,000
Army Street	- 3,400	- 3,800
	55,600	56,200

The above estimate for total receipts of the Society in 19[illegible], or 20%, of the total benefits on these policies. The corresponding renewal termination rate [illegible] with all classes at ages 1[illegible]. If desired except, it is possible that there will be an [illegible] rather than a loss as above estimated at very first. The same might prove the case at [illegible] ages, especially if a [illegible]-type [illegible] were provided [illegible] Treasury to the Endowment.

The twelve-[illegible] equal of benefits on Edited Bonus [illegible] of [illegible] is [illegible] are

[illegible]	23,[illegible] valuation
[illegible]	[illegible]
24 Bonus	[illegible]
	[illegible]
Estimated 1[illegible]-[illegible] benefits	
(1[illegible])	24,000

Edited partakers at the [illegible] with Taxpayer Endowment are

23 Bonus Cream (1[illegible])	1,[illegible]
50%	[illegible]
24 Bonus	[illegible]
	[illegible]
Estimated 1[illegible]-[illegible] benefits	
(1[illegible])	23,000

It has been estimated that the [illegible] benefits on the Taxpayer Treasury Endowment Investment and Corp Bonus will be 50,000 valuations. The proportion of corporations for coverage benefits on the Buy Policy in the [illegible], was 5%, of which approximately 30,000 used the six-[illegible] Bonus Bonds. Under benefits and probably 20 per cent will [illegible] can be [illegible] essentially, except at such times as a vacancy is caused by [illegible] or similar reasons. It is our opinion that the capacity of the Treasury may be placed at [illegible] over-[illegible] and that this capacity will be reached by 1950. When this capacity is reached, much of the annual benefits will be [illegible] to Edited and other policies already held the Municipal Treasury is constituted.

Assuming that both the Taxpayer Treasury and the Municipal Treasury are established by 1[illegible], our estimates of the [illegible] on the two annuals in 1[illegible] and 1[illegible] are given below.

Taxpayer Treasury

	Estimated Benefits	
	1[illegible]	1[illegible]
Earnings	[illegible]	[illegible]
Invested Treasury	[illegible]	[illegible]
	[illegible]	[illegible]
Edited Bonus	[illegible]	[illegible]
	[illegible]	[illegible]
Silver Income	[illegible]	[illegible]
	[illegible]	[illegible]
Treasury Endowment	[illegible]	[illegible]
	[illegible]	[illegible]
Army Bonus	[illegible]	[illegible]
	[illegible]	[illegible]

Division Street	- 8,000	- 8,800
	47,600	47,400

Marginal Freeway

Bayshore Freeway	20,000	33,200
Spear Street	- 3,000	- 3,000
	17,000	30,200
Galvaz Street	+ 7,000	+ 7,800
	24,000	38,000
Third Street	+ 4,000	+ 5,000
	28,000	43,000
Army Street	+ 4,000	+ 4,500
	32,000	47,500
Third Street	- 8,000	- 8,500
	24,000	39,000
King Street	+12,000	+13,000
	36,000	52,000
Folsom Street	+ 8,000	+ 9,000
	44,000	61,000
Market Street	- 8,000	-21,000
	36,000	40,000
Sansome Street	+ 6,000	+ 8,000
	42,000	48,000
Stockton Street	- 5,000	- 6,000
	37,000	42,000
Columbus Avenue	+ 3,000	+ 3,000
	40,000	45,000
Van Ness Avenue	-15,000	-17,000
Franklin Avenue	25,000	28,000

In estimating the division of the traffic at the intersection of the Bayshore and Marginal Freeways, it is assumed that because of the Bayshore Freeway having reached its capacity north of Alemany Boulevard, the entire increase at the intersection of the two Freeways would use the Marginal Freeway. The methods of arriving at the estimates at the northern terminal of the Marginal Freeway and at the several connections are given below.

In 1937, approximately 125,000 vehicles daily crossed Van Ness Avenue in and east and west direction on Geary and the streets north thereof. At the time of this count, the Golden Gate Bridge had been opened to traffic only a short time and the Sausalito ferries were still in operation. Since 1937 the traffic on the Bridge has increased by an average of 5,600 cars daily to an average of 14,700 vehicles. Using the factors developed at the start of Section V, by 1950 the traffic on the above streets would increase by about 25%, or a total of 156,000 vehicles. The McClintock

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible] Income

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

In estimating the dividend of the Trustee at this [illegible] of the Customs and Excise and Inland Revenue, it is assumed that [illegible] Trustee receive the equivalent of [illegible] Banking Facilities [illegible] Treasury Bonds at the [illegible] Treasury would [illegible] plus Interest. The [illegible] of certain of the [illegible] Counsel of the [illegible] under below.

In 1987, approximately 125,000 [illegible] Realty [illegible] and [illegible] and most [illegible] the [illegible] this time of [illegible] the [illegible] Bridge [illegible] [illegible] Realty a short [illegible] the [illegible] 1987 the [illegible] to an [illegible] Realty to an [illegible] the [illegible] Increase by [illegible]

report gives some data as to the destination of these vehicles. From applying this data, we estimate that by 1950 the traffic on the Marginal Freeway and through the Broadway Tunnel would each be about 33,000 vehicles.

As an approximate check on the estimate for the Freeway, the following calculation is made:

		% to Freeway	
From 1937 Counts - 12 Hour			
Union Street	4,100	x 50	- 2,050
Bay Street	8,700	x 80	- 6,950
North Point Street	4,800	x 80	- 3,800
			12,800
50%			6,400
24 Hour Traffic			19,200
1943-1950 Traffic 25%			4,800
			24,000
Additional traffic Golden Gate Bridge 5,600 cars daily - 50% to Freeway			2,800
Golden Gate Bridge traffic diverted from other routes 20% - 14,700			2,900
			29,700
Induced or generated			3,300
Total Estimated Daily Traffic - 1950			33,000

Future increases in the traffic that would use the Marginal Freeway depends on several factors. Among them may be mentioned:

1. The development of the area. It appears reasonable to assume that there will continue to be a considerable increase inthe population of Marin County. This will be reflected in increased traffic across the Golden Gate Bridge, which may be assumed to increase from its 1943-1950 average of 14,700 cars daily to 17,000 cars in 1960 and 20,000 cars daily in 1970. Approximately half of these increases would be reflected in increased traffic on the Marginal Freeway. It does not appear probable that there will be any considerable increase in population in that part of San Francisco adjacent to the north end of the Freeway. There is however a trend for increased use of the motor car by the average owner which trend would result in increased use of the Freeway.

2. Congestion on Parallel Routes. We believe the Broadway Tunnel will be used to the capacity of its approaching streets a short time after its completion. The 1937 traffic and our estimate of 1945 traffic under normal conditions are shown by the following tabulation.

reports given some data as to the beginning of these problems. From
supplying this data, we anticipate that by 1980 that traffic on the regional inter-
may not through the Pembina Tunnel would exceed 30,000 vehicles.

As an appendix to this report we have, the following
calculations is made

To
Dakota

From 1970 Census - 12 Cases

Public Census	4,100 @ 80	- 3,280
Log Sheets	6,700 @ 80	- 5,360
North Point Census	4,800 @ 80	- 3,840
		12,480
		4,400
		16,880
24 Hour Traffic		4,880
1965-1970 Traffic 20%		20,760

Additional Traffic Dalton Dale Dodge
3,600 more daily - 80% to Fremont
Dodge Dale Dodge traffic diverted
From other routes 20% - 14,700

	2,880
	17,580
	3,520
Induced or generated	21,100
Total Projected Daily Traffic - 1980	21,100

Future increase in the traffic that would use the regional freeway be-
yonds an arterial facility. Some that may be considered:

1. The development of the area. It appears feasible to assume
that there will be a considerable increase in the residential
of Dakota County. This will be predicted to increased traffic
Dodge Dale Dodge by 3,600 vehicles, which may be assumed to increase from its 1965-1980
average of 14,700 each county to 17,700 cars in 1990 and 20,000 cars daily
in 1990. Approximately half of these increases would be attributed to re-
gional traffic on the Regional Freeway. It does not appear probable that
there will be any substantial increase in population in that part of Dan
Dakota County adjacent to the Pembina Freeway. There is however a
possible result in increased use of the freeway.

2. Congestion on Arterial System. As indicated the traveling Public
will be used to the capacity of its alternative streets & about this
time the congestion. The 1990 traffic and our estimate of 1980 traffic
under several conditions are shown in the following tabulations.

Street	Between	Daily Traffic 1937	Daily Traffic 1945 Normal	Max. Hr. 1 Direction 1945	Each Direction No. of Traffic Lanes*	Each Direction Maximum Hourly Capacity
Van Ness	Eddy - Ellis	28,000	30,800	1,840	3 T	1,900
Van Ness	Pacific - Broadway	24,000	26,400	1,400	3 T	1,900
Polk	Pacific - Broadway	9,000	10,000	600	1 T	500
Larkin	Pacific - Broadway	7,500	8,200	500	1	700
Hyde	Pacific - Broadway	3,300	3,600	200	1 T	500
Leavenworth	Pacific - Broadway	4,500	5,000	300	1	700
Powell	Pacific - Broadway	4,500	5,000	300	1 T	500
Stockton	Pacific - Broadway	7,500	8,200	500	1 T	500
Stockton	Tunnel	12,000	13,200	800	2 T	1,400
Grant	Pacific - Broadway	3,000	3,300	200	1	500
Kearny	Clay - Washington	8,200	10,000	600	2 T	1,200
*Montgomery	Clay - Washington	10,000	11,000	660	2	1,400
Columbus	Pacific - Broadway	10,000	11,000	660	2 T	1,200
Columbus	Vallejo - Green	11,000	12,100	730	2 T	1,200
Columbus	Green - Union	13,000	14,300	850	2 T	1,200
California	Jones - Leavenworth	18,500	20,400	1,200	2 T	1,200
Pacific	Jones - Leavenworth	13,200	14,500	870	1	700
Bay	Polk - Larkin	13,200	14,500	870	2	1,400
No. Point	Polk - Larkin	7,200	8,000	480	1 T	500
Bay	Mason - Powell	5,200	5,800	350	2	1,400

T - Trolley tracks included as vehicular lane
* - Not including parking lane
** - One direction only

The above tabulation indicates that several of the streets near the north end of the Marginal Freeway are nearing their capacity. The construction of the Broadway Tunnel will result in loading the Columbus Avenue-Stockton Street route to its capacity.

We believe that the construction of the northern end of the Marginal Freeway will be necessary by 1960 and that the traffic may be estimated at 40,000 and 45,000 vehicles in 1960 and 1970 respectively.

TRAVEL TIMES

When there are alternate routes available, there are several factors which affect the driver's choice thereof. Among these are the travel times required to reach his destination and the amount of congestion on the different routes.

Consider the conditions at Sixth and Harrison Streets under the following assumptions:

A. The Marginal Freeway is constructed via the Sixth Street Viaduct to Harrison, thence to the Embarcadero and thence northward along the Embarcadero. (Alternate Location E)

		Daily Traffic				
		1924				
		[illegible]	Normal	[illegible]	[illegible]	[illegible]
[illegible] Road	Bixby - [illegible]	24,000	20,[illegible]	3,[illegible]	[illegible]	1,[illegible]
[illegible] Road	Pacific - [illegible]	14,000	[illegible]	1,[illegible]	[illegible]	[illegible]
[illegible]	Pacific - Bixby	7,000	2,[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ia	[illegible]ia - Atwood	4,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Pacific - Bixby	3,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ro	Pacific - Atwood	6,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ll	[illegible]ia - Atwood	4,[illegible]	3,[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ston	Pacific - Atwood	7,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ston	Transcl	12,[illegible]	[illegible]	[illegible]	[illegible]	1,[illegible]
[illegible]	Pacific - Atwood	2,[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ery	Clay - [illegible]ton	8,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ery	Clay - [illegible]ton	4,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ston	Pacific - Atwood	10,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ston	[illegible]ia - Union	11,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]ston	Union - Tulsa	12,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]fornia	Union - Lawrence	13,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]tia	Union - Lawrence	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Polk - Lutsia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Point	Polk - Lutsia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Tulsa - Powell	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

T - Traffic tracks included as volumetric lane
* - 8th Industrial Testing Zone
** - Two directional only

The above tabulation indicates [illegible] record of the [illegible] with the usual rank of the Regional Planning are popular track counting. The construction of the Kearney Tunnel will result in lowering the Columbus Avenue-Columbia Street grade to its ultimate.

We believe that the construction of the [illegible] Tunnel will be necessary by 1940 and that the traffic may be estimated at [illegible] and [illegible] vehicles in 1930 and 1940 respectively.

Public Lands

[illegible] there are already traffic available, there are several factors which [illegible] the district's choice thereof. [illegible] are the general items considered in [illegible] deficiencies and the amount of expenditure to be [illegible] project.

[illegible] the conditions at which the [illegible] Planning Commission

1. The Regional Planning is concerned via the Rock Island Viaduct to [illegible] thence to the Industrial and Wholesale territory along the Embarcadero. (Alternate Location B)

B. The Marginal Freeway is routed via a bridge east of the Third Street (Channel) Bridge with the Sixth Street Viaduct omitted. (Recommended Location)

C. The Marginal Freeway is routed via a bridge east of the Third Street Bridge with the Sixth Street Viaduct also constructed.

D. An elevated viaduct has been constructed from Sixth and Harrison parallel to Sixth Street terminating at Mason and O'Farrell Streets

E. Adequate connections, not elevated, have been made to connect with Second and New Montgomery Streets.

F. The Division Street connection to the Bayshore Freeway has been constructed with an overhead connection to the north side of Market Street.

G. The Marginal Freeway has been completed from a connection with the Bayshore Freeway at the County Line.

H. Average Speeds - Peak Hour

Freeways		40 m.p.h.
City Streets -	Central Business District	10 m.p.h.
	Other	15 m.p.h.

The travel times to points east of Van Ness Avenue and north of Market Street from the intersection of the two Freeways, under Assumption A, are shown on Drawing 3.

Because of the shorter distances, the travel times via the Bayshore Freeway from the intersection to Sixth and Harrison Streets is 2 minutes less than via the Marginal Freeway. Other considerations being equal, the motorist will prefer the Bayshore route. Also having arrived at this intersection, the motorist destined to points in the Central Business District east of Sansome Street can reach his destination in a shorter time by routes other than the Marginal Freeway.

The travel times from the intersection of the two Freeways to the Ferry Building by the Bayshore Freeway to Sixth and Harrison, thence by the Marginal Freeway is 10-1/2 minutes. Using the Marginal Freeway (by this location) for the entire distance, the travel time is 12-1/2 minutes. In so far as time is a controlling factor, and assuming no congestion on either route, the probable choice of those entering at the County Line would be the Bayshore Freeway.

Drawing 4 is similar to Drawing 3 except that it is prepared under Assumption B using the recommended location via China Basin. The time from the intersection to the Ferry Building is 11-1/2 minutes, one minute less than by the former routing (entire distance via Marginal Freeway.) This drawing

b. The Imperial Freeway is routed via a bridge west of the Tidal Inlet (Channel) Bridge with the Pacific Shore Viaduct omitted. (Uncommitted Location)

c. The Imperial Freeway is routed via a bridge west of the Inlet Shore Bridge with the Beach Street Viaduct also constructed.

d. An elevated Viaduct has been constructed from Beach and Imperial to Beach Street terminating at Wharf and Imperial Streets

e. Adequate connections, not elegant, have been made to connect with Tunnel and Bay Boulevard Streets.

f. The Pleasure Street connection to the Golden Freeway has been constructed with an overhead connection to the north side of Imperial Street.

g. The Imperial Freeway has been completed into a connection with the Seaside Freeway at the County line.

h. Average Speed - Peak Hour

Freeway	m.p.h.
City Streets - Central Business District	m.p.h.
Other	m.p.h.

The travel times to points east of Pico have grown and north of Beach differ from the interpretation of the two freeways. Motor Locations A, are shown on Drawing 2.

Because of the shorter distances, the travel times via the Imperial Freeway from the intersection to Beach and Pacific Shore is 1 minutes than via the Imperial Freeway. Other considerations being equal, the motorist prefer the Imperial route. Also having arrived at this intersection, the motorist desires to locate in the Imperial Business District because there can reach his destination in a shorter time by routes other than the Imperial Freeway.

The travel times from the intersection of the two freeways to the County Building by the Imperial Freeway to Tidal and Beached, thence by the Imperial Freeway is 10-1/2 minutes. Using the Imperial Freeway (by this location) for the entire distance, the travel time is 12-1/2 minutes. In so far as time is a controlling factor, and according to comparable motorists, the problem client of these motorists the County Line would be the Imperial Freeway.

Drawing A is similar to Drawing 3 except that it is routed using Alternative 3 using the recommended location via Plans 2 and. The time from the intersection to the County Building is 11-1/2 minutes, one minute less time by the Freeway routing (entire distance via Imperial Freeway) This diverted

indicates that most of those destined to the Central Business District could still save time by using the Bayshore rather than the Marginal Freeway.

Under Assumption C the results would be very similar to those under Assumption A. If adequate facilities are provided to care for all of the traffic, a very large proportion of the traffic would leave the Marginal Freeway and travel to the Central Business District via the Sixth Street Viaduct.

We believe the following an approximate portrayal of conditions at Sixth and Harrison in1970 under Assumption A.

ESTIMATED TRAFFIC 1970
Assumption A
Intersection at Sixth and Harrison

Number of Vehicles

Entering From		Leaving Via: Bay Br. E.B.	Bayshore Fwy W.B.	Marginal Freeway S.B.	Marginal Freeway E.B.	Sixth St. Elev.N.B.	Local Streets
r Bridge W.B.	16,000	-	4,000	2,000	-	8,000	2,000
rshore Fwy E.B.	47,000	4,000	-	2,000	8,000	18,000	15,000
nal Fwy N.B.	24,000	2,000	2,000	-	6,000	8,000	6,000
W.B.	20,000	-	8,000	6,000	-	-	2,000
xth St. Elev. S.B.	41,000	8,000	18,000	8,000	-	-	7,000
cal Streets	32,000	2,000	15,000	6,000	2,000	7,000	-
	180,000	16,000	47,000	24,000	20,000	41,000	32,000

As comparisons, the distribution structure at the Oakland end of the Bay Bridge has a daily traffic of about 100,000 cars. Less than 50,000 cars daily entered, in 1937, the heaviest intersection, Army Street and Potrero Zvenue, in San Francisco.

From the standpoint of traffic, we believe -

1. The competitive position of the Marginal as compared to the Bayshore Freeway will be improved by routing the Marginal Freeway via a bridge over China Basin rather than via a connection with the Bayshore Freeway at Sixth and Harrison Streets and thence a connection to the Embarcadero.

2. Under any circumstances, the traffic at the Sixth and Harrison intersection will be extremely heavy. Anything that can be done in planning to reduce the volumes at this point is desirable. The State Highway Engineers recognize this fact and have introduced, in their layout of this structure, two sets of connections to local streets.

Indication that some of these decisions to the Central Planning Staff would still have to be made the following day when the Regional Planners

Under Instruction 7 the results would be very similar to those under Assumption 6. It obviously [illegible] not involved to have the 6.7 of the facility, a true [illegible] of the Profit, would have the Regional Planner and Board by the Central Planning Staff via the Block Survey Machine.

We believe the Policeman on [illegible] potential of conditions in Ghana and Southern Italy when [illegible] 4.

[illegible] Study 1970

Assumption 4

[illegible] and Planning

Number of Units Investing [illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	£4,000	-	£4,000	-	£4,000
[illegible]	£2,000	£4,000	£ [illegible]	£8,000	£12,000
[illegible]	£4,000	£1,000	£2,000	-	£3,000
[illegible]	£2,000	-	£4,000	-	£4,000
[illegible]	£2,000	£4,000	£8,000	-	£12,000
[illegible]	£8,000	£4,000	£16,000	-	£4,000
[illegible]	£8,000	£4,000	£12,000	£8,000	£4,000
[illegible]	£28,000	£8,000	£52,000	£8,000	£4,000
[illegible]	£68,000	£24,000	£72,000	£24,000	£32,000

As consequence, the distribution structure at the Oakland end of the Bay Bridge has a daily capacity of about 320,000 cars. Less than 20,000 cars daily returned, in 1977, the Berkeley Intermediate, Bay Street and Webster Tunnels, to the Freeway.

From the standpoint of traffic, we believe -

1. The [illegible] position of the Bridge at compared to the Southern Freeway will be improved by routing the Regional Freeway via a bridge over Point Isabel rather than a connection with the Southern Freeway at Ninth and Harrison Streets and thence a connection to the Embarcadero.

2. Under any circumstances, the inertia at the Ninth and Harrison intersection will be extremely heavy. Anything that can be done to [illegible] to reduce the volume at this point is desirable. The planning of Bridge Entrance structures this and here [illegible] Under Section 12 of this statement, the role of [illegible] to local [illegible].

3. For these reasons, we believe the proposal of the Sixth Street Viaduct should be abandoned and that section of the Marginal Freeway between Third and Mariposa and the south end of the Embarcadero constructed in lieu thereof.

Drawing 5 shows comparative travel time from Van Ness Avenue to the Central Business District via California Street, the Broadway Tunnel and the Marginal Freeway. This drawing may be interpreted as follows:

1. The Marginal Freeway will afford the most direct route fromthe Golden Gate Bridge to the Central Business District for traffic originating in the Marina and the Golden Gate Bridge. The time from the intersection of Lombard and Franklin Streets to the Ferry Building via the Freeway is 3-1/2 minutes. The time by existing streets is 13 minutes.

2. From Drawings 123, 131 and 133 of the McClintock Report it will be noted that a considerable portion of the traffic using Gateway G (Post, Bush, Pine and California Streets), Gateway L (Pacific Avenue and Broadway) and Gateway M (Union, Bay and North Point Streets) travels northward along Van Ness Avenue and has its destination in the North Beach Section. This movement is also indicated on Drawing 121 of the same report. This traffic would be increased by the facilities of the Marginal Freeway as compared to Bay and North Point Streets. A considerable portion of traffic now passing through the Central Business District would be diverted to the less congested route.

Drawing 107 of the McClintock Report indicates the routing of the Golden Gate Bridge traffic in 1937. This has been changed, to a minor degree, by the development of the route along 19th Street and the Park-Presidio Boulevard, but the general outline of the heavy traffic with many trucks along Van Ness Avenue and through the Mission remains unchanged. The construction of the Marginal Freeway would divert a very considerable portion of this traffic, trucks especially.

A travel time study, for which no drawing has been prepared is via Third Street at grade from its intersection with the Bayshore Freeway to Mariposa Street and thence via an elevated viaduct to the Ferry Building. Third Street has been discussed in Section II hereof. With traffic signals on this street so adjusted as to permit an average speed of 25 miles per hour, the travel time from the intersection of the two Freeways via Third Street to 16th Street and thence by viaduct to the Ferry Building would be eleven minutes or no more than via the Marginal Freeway for the entire distance.

In the above, estimates have been made of the traffic that would enter and leave the Marginal Freeway at its termini. It now remains to estimate

3. For these reasons, we believe the proposal of the Third Street Tube should be abandoned and that portion of the Dedicated Freeway between Third and Harrison and the south end of the Embarcadero incorporated in Alaa Shared.

Crossing 5 above accommodates traffic from the Bay Bridge to the Central Business District via California Street, the Dedicated Tunnel and the Dedicated Freeway. This diversion may be accomplished as follows:

1. The Dedicated Freeway will allow the most direct route traffic desires from the Bridge to the Central Business District for traffic originating in the Berkeley and the Oakland area. The time from the intersection of Oakland and Treasure Is. to the Ferry Building is 3-1/2 minutes. The time by existing streets is 15 minutes.

2. Fire Station No. 2, 231 and 237 of the Southern Pacific Co. have declared that a consolidation (office of the Pacific Coast Coast Line, Pier and California Avenue) Subway & (Pier 7, Pier 9 and Pier 7) and Gateway 2 (Pier 1, Pier 3 and Pier 5) would increase the time from Alameda to the Ferry Building. This movement is also indicated on Drawing 127 of the Bure Report. This traffic would be intercepted by the Facilities of the Dedicated Freeway as designed by Bure and Work Under Crowds. A considerable portion of traffic now passing through the Central Business District would be diverted to the less congested Route.

Drawing 127 of the mentioned Report indicates the routing of the existing Bay Bridge traffic in 1970. This has been changed, to a minor degree, by the development of the areas along the Water Front and the Fisherman's Wharf, but the general routing of the Report remains as it was. Along the Water Front the Dedicated Freeway would divert a very considerable portion of this traffic, thus materially.

A travel time study, for which no figures has been prepared to date, should be made from its intersection with the Bayshore Freeway to Fourth and Bryant via an elevated viaduct to the Ferry Building. Should there be time to spare in getting to Bryant, this traffic could be held on this viaduct to the point of entrance of it to the Bay Bridge, the travel time from the intersection of the two Freeways via Third Street to the Ferry Building would be shorter by reason of the fact that it would be always possible to go there via the Dedicated Freeway for the entire distance.

In the event, unfortunately, the Bay Bridge traffic does reach Main and Early the Dedicated Freeway at its terminus. It may continue to Bryant

the number that would enter and leave at the various connections. Accurate data for this detail are not available. Therefore the following should be considered as our best judgment in the matter.

Starting from the south end of the Freeway Drawing 1 indicates a connection at Ingerson Street. This connection would not receive any appreciable amount of traffic until after the development of the Tidelands. Therefore, no estimates of traffic are made for this connection.

We are informed that peace time employment at Hunters Point Navy Yard is estimated at 20,000. Some of these employees will leave and enter the yard by foot, some by bus and some by private automobile. The industry will require a considerable amount of trucking. A movement of 5,000 vehicles daily in and out of the yard or a total of 10,000 movements is estimated. Of these about 3,000 would use the Spear Street connection and 7,000 the Galvez Street connection.

At Third Street, the Freeway might lose about 2,000 of the vehicles entering at Galvez. It would gain most of the traffic generated on Third Street between Bayshore Boulevard and Islais Creek. In1937 this amounted to 6,400 vehicles. By 1960, this might be expected to increase to 8,000 vehicles of which 6,000 would use the Freeway. The net gain at this point would be about 4,000 cars.

In 1937, the gain in traffic on Third Street at Army Street was 4,200 vehicles. We assume a net gain of 4,000 vehicles to the Freeway in 1950.

The traffic on Third Street north of Army Street may be tabulated as follows:

	1937	Estimated 1960
Leaving Army Street intersection - north bound	19,500	24,000
Entering Mariposa Street " " "	19,500	24,000
Leaving Mariposa Street " " "	19,000	23,000
Entering Berry Street " " "	22,500	28,000
Leaving Berry Street " " "	11,400	14,000
Berry Street leaving Third Street - east bound	19,500	24,000
Berry Street entering " " " "	6,700	8,000

We believe there would be a net loss of traffic at Third Street of 8,000 vehicles and a gain of 12,000 vehicles at King Street.

Folsom Street has been selected as affording the most convenient means of access to the Bay Bridge traffic and for the traffic originated in the area between Harrison and Mission Streets.

It is believed that in 1960 the average week-day traffic across the Bridge will be 70,000 vehicles. About 13% of this traffic would be better served by the Marginal Freeway, north and west bound, than by other routes. Six per cent of this traffic would use the Marginal Freeway south bound. At this connection, there would be, fromthe Bay Bridge, a gain of 9,000, a loss of 4,000 vehicles, or a net gain of 5,000 vehicles. There would also be a considerable amount of traffic using this connection in and out of the area between Harrison, Third, Market and the Embarcadero.

Assumptions in this respect are as follows:

Of the 24,000 cars crossing the China Basin Bridge, about

12.5%	or	3,000	cars	would	leave	the Freeway at	Folsom-Bay Bridge
12.5	or	3,000	"	"	"	" "	" Folsom-Local
50.0	or	12,000	"	"	"	" "	" Market Street
8.3	or	2,000	"	"	"	" "	" Stockton Street
16.7	or	4,000	"	"	"	" "	" Van Ness and Franklin

Of the 12,000 cars entering the Freeway at King Street approximately

6,000	cars	would	leave	the	Freeway at	Market Street
1,000	"	"	"	"	"	" Stockton Street
5,000	"	"	"	"	"	" Van Ness and Franklin

At the Folsom Street connection, it is believed that, in addition to the 9,000 cars entering the Freeway from the Bay Bridge, about 5,000 will enter from local territory, or a total of 14,000. These will be destined

2,000 to Stockton Street
12,000 to Van Ness and Franklin

The net gain to the Freeway at Folsom Street is 8,000 cars.

At Market Street, from the above estimates, there would be a loss of 19,000 cars. There would remain on the Freeway 5,000 cars destined to Stockton Street and 26,000 cars destined to Van Ness and Franklin. There would be accretions of about 11,000 cars of which 1,000 would be destined to Stockton Street and 10,000 to Van Ness and Franklin. The net loss would be 8,000 cars.

North and west of Market Street, there would be a loss of 5,000 at Stockton Street and gains of 6,000 and 3,000 at Sansome Street and Columbus Avenue with a total of 40,000 at the Western Terminus of the Freeway.

VI. DESIGN

The scope of this investigation does not include the detail design of any of the structures involved. On the other hand, even an approximate estimate involves assumptions as to the facilities involved. Among these assumptions are:

1. Character of traffic for which provision is to be made

Many of the freeways throughout the country have been planned for passenger cars only. McClintock's suggestion for a system of limited access ways for San Francisco was based on such a proposal.

The Freeway herein considered serves an industrial area (the waterfront, freight yards, Hunters Point Navy Yard, etc.) to a very large extent. We have assumed that the final decision would be that the Freeway should accommodate all classes of traffic. The estimates of traffic and estimates of cost have been based on such assumption.

The following percentages are typical of each class of traffic.

Passenger Cars	90.0
Motorcycles	0.2
Buses	2.5
Trucks	6.8
	100.0

As compared to a structure for passenger cars only, provision for carrying buses would increase the construction cost by 25 per cent and for heavy trucks by 50%. Conversely, the estimates of construction given in Section VII may be reduced by 33 per cent if passenger cars only are to be accommodated and by 17 per cent if provision is made for buses but not for heavy trucks.

The possibilities of providing improvements in mass transportation by means of buses on the Freeway appear very important. The investigation of this matter is not within the scope of this investigation.

2. Number of traffic lanes.

A Freeway with two traffic lanes in each direction is capable of carrying peak hour traffic of 3,000 cars in each direction at an average speed of 40-45 miles per hour. At an average speed of 20-25 miles per hour, these capacities increase by 20 per cent. These two values correspond to average daily traffic of 40,000 and 48,000 cars. The capacity of a six-lane structure, three lanes in each direction, would be 40 per cent greater. Because of "weaving" the capacity does not increase in proportion to width.

[illegible]

The scope of this investigation does not include the detail design of any of the structure involved. It has only been [illegible] that is currently involved sufficiently to [illegible] the feasibility of the [illegible] and the conditions are:

1. [illegible] of traffic for which provision is to be made

Many of the freeway [illegible] has usually been planned for peak-hour use only. Preliminary [illegible] of [illegible] needs only for New Freeways [illegible]

The freeway [illegible] carried during [illegible] the [illegible] period, Monday thru Friday, was [illegible]. It is very [illegible]. We have assumed that the final [illegible] would be [illegible] all [illegible] of traffic. The estimates of traffic [illegible] of real [illegible] is [illegible].

The following percentages are typical of [illegible] of traffic.

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
	[illegible]

[illegible] to a minimum for [illegible], providing for [illegible] lanes would increase the construction cost by [illegible] per [illegible] thru [illegible] by [illegible]. Conversely, the [illegible] of [illegible] [illegible] may be reduced by [illegible] per cent if [illegible] is made for [illegible] [illegible].

The possibilities of providing [illegible] in [illegible] of these [illegible] on the freeway [illegible] are [illegible]. The [illegible] of this matter is not within the scope of this [illegible].

2. [illegible] of [illegible]

A freeway with the [illegible] lanes in each direction is capable of [illegible] peak hour [illegible] of 3,000 cars in each [illegible] in an average speed of 40-45 miles per hour. It is possible [illegible] 50-55 miles per hour, these [illegible] [illegible] by 20 per cent. [illegible] two [illegible] increased to provide [illegible] of 4,000 and 5,000 cars. The [illegible] of a six-lane [illegible], three lanes in each direction, would be 4½ per cent greater. Because of "weaving" the capacity [illegible] [illegible] is [illegible] to [illegible].

The traffic estimates in the preceding section indicate that, for some portions of the Freeway a four-lane structure would have capacity for many years into the future. The uncertainties of these estimates have been stated. It has been the experience that Freeways built in the past twenty years have reached their capacity sooner than was anticipated. The Bay Bridge and the Bayshore Highway are examples.

This question is one that should be reviewed in the light of the latest developments before construction is started on any section of the Freeway. In the meantime, especially in case of Tideland Reclamation, sufficient right of way should be reserved for the greater capacity.

3. Width of Traffic Lanes

Throughout the development of the modern highway, the standards of lane width have been gradually increasing. For a freeway through rural areas, where speed of sixty miles per hour or greater are planned, the lanes should not be less than 12 feet in width. In cities, over the comparatively small distances speed is of less importance. We believe lanes 11 feet in width with a central dividing, or median, strip not less than 3 feet in width sufficient for speed of 45 miles per hour and have based our estimates accordingly.

4. Clearances

The following clearances are recommended:

Overhead - 14'-6" minimum at curb

Side - To railings and obstructions, minimum

Driver's Side	1'-6"
Opposite Side	2'-0"

5. Curves

Curves on the Freeway should have a minimum radius of 1500 feet wherever practicable and in no case less than 950 feet. Roadway lanes should be widened for curves less than 1500 feet radius. All curves should be superelevated.

6. Grades

Assuming truck and bus operations, grades on the Freeway should be held to 3 per cent. On ramps 8 per cent descending and 5 per cent ascending are permissible. In some cases these will have to be increased to avoid interference with essential railroad tracks.

The traffic emission in the township should [illegible]. For some portion of the freeway a four-lane structure would have to be built. The construction of these extra lanes should [illegible]. It has been the practice that freeway width in the past twenty years have doubled [illegible] every ten additional.

Some question is now that should be reviewed in the light of the latest development before construction is started in any portion of the freeway. In the meantime, especially in case of [illegible] adjacent right of way should be preserved for the future purpose.

3. Width of Traffic Lanes

Throughout the development of the various highway, the standard of lane width have been gradually increased. For a freeway through rural areas, where speed of sixty miles per hour or [illegible] are allowed, the lanes should not be less than 12 feet in width. In cities, where the speed is relatively small [illegible] should be of less importance. A lesser lane of 11 feet in width will [illegible], or making [illegible] lanes than 9 feet in width sufficient for speed of 45 miles per hour and have based our estimates accordingly.

4. Clearance

The following clearances are recommended:

Overhead - 14'-6" minimum [illegible]

Side - 10 feet[illegible] [illegible], minimum

Driver's Side 12'-0"
Opposite Side 2'-0"

5. Curves

Curves on the freeway should have a minimum radius of 1000 feet wherever practicable and in no case less than 600 feet. Roadway lanes should be widened for curves less than 1000 feet radius. All curves should be superelevated.

6. Grades

Limiting grade for the freeway, grades on the freeway should be held to 7 per cent. On steep [illegible] 8 per cent grade may be [illegible]. In some cases there will have to be increased to avoid interference with [illegible] highway.

7. Design Loadings

The estimates herein given contemplate structural design on the basis of the standard H-20-516 loading, i.e., a 20-ton truck with a 16-ton semi-trailer.

Generally the structures which have been contemplated are structural steel viaducts with concrete paving slabs. Structural steel, rather than reinforced concrete, has been selected for the following reasons:

a. Generally, the structures are over existing streets and, in many cases, adjacent to railroad tracks. To avoid interference with these tracks and to permit the greatest use of the street surface it is necessary to keep the dimensions of the supporting structure as small as practicable.

b. For most of the structures supporting these structures, piles of considerable length, or caissons carried to considerable depths, will be required. It is desirable to avoid the heavy loads which a concrete superstructure would involve.

7. [illegible]

[illegible] [illegible] [illegible] [

VII. ESTIMATES OF COST

There are two essentials to an accurate estimate of the cost of construction of any project, the quantities of materials involved and the unit costs which must be applied to such quantities. The determination of the quantities involves at least a preliminary design of the structures. Approximate estimates can also be made by comparison of costs with similar structures on a square foot or similar basis.

The scope of the present investigation does not include detail design. In so far as possible, reliance has been placed on comparisons with other structures. The results thus obtained have been checked by making preliminary designs of the structures and applying unit costs.

In any comparison with the costs of other structures or in the application of unit costs it is necessary to consider the fluctuations in the price levels at various periods. In general, these fluctuations in the price levels consist of a general long time increase with material deviation from such trends dependent on general economic conditions.

The fluctuations in unit costs over the past forty years are shown by Table VII-1. These indices are based largely on building construction. To some extent, because of the developments in construction equipment, costs of heavy construction have not increased as much as indicated on this table. The use of this table will result in the estimates being on the high side.

Table VII-2 lists several vehicular tunnels which, either by reason of their short length or not being used by motor vehicles, have not been equipped with artificial ventilation. A very wide range of costs per square foot is indicated.

Table VII-3 lists other tunnels including equipment for artificial ventilation.

We have also estimated the quantities in the tunnels considered in this investigation. We believe a cost of $20.00 per square foot for tunnels without artificial ventilation and $25.00 per square foot for tunnels with artificial ventilation are ample for present day cost levels and local conditions.

Tables VII-4 and VII-5, respectively, list square foot costs for fixed and movable bridges. In these cases, the unit costs vary even more widely than do tunnels depending on foundation conditions, span lengths and other variables. Referring to Table VII-4, the bridges with under $10.00 per square foot are more nearly comparable to the construction herein proposed.

VII. Selection of Cost

There are two essentials to an accurate estimate of the cost of construction of any project, the quantities of the various materials and the unit costs which must be applied to each quantity. The determination of the quantities involves at least a preliminary design of the structure. Approximate estimates can also be made by comparison of costs with similar structures on a square foot or cubical basis.

The needs of the general layout will govern the ultimate design. In so far as possible, sections have been placed to conform with other structures. The details then must be worked out and approved by the preliminary drawings of the structure and specific unit costs.

In any comparison with the costs of other structures as in the application of unit costs it is necessary to consider the fluctuations in the price level at various periods. In general, since fluctuations in the price level consist of a general rise that increases with industrial activities this rule should be considered.

The fluctuations in unit costs over the past forty years are shown by Table VII-1. These indices are based largely on building construction. To some extent, because of the development to manufacturing equipment, costs of heavy construction have not fluctuated to such an extent as on this table. The use of this table will result in the application factor on the high side.

Table VII-2 lists several estimates based upon, either the number of cubic meters length or unit basis used by earlier writers, how put into application with artificial ventilation. A very wide range of costs is shown that is indicated.

Table VII-3 lists other tunnels including equipment for ventilated ventilation.

We have also estimated the quantities in the tunnel construction in this investigation. We believe a cost of $15.00 per square foot for tunnels without artificial ventilation and $15.00 per square foot for tunnels with artificial ventilation may apply for present day road layouts and local conditions.

Tables VII-4 and VII-5, respectively, list costs for cuts for five and seven lanes. In these cases, the cuts range very wide because of the necessity of excavating in formation rock. From the tables, it can be seen that the cost of tunnels without ventilation will be $10.00 per square foot and others ventilated. Referring to Table VII-4, the tunnel with ventilation $10.00 per square foot are more nearly economical to the construction systems proposed.

For the viaducts proposed for the Marginal Freeways, the costs at different points along the route will vary greatly. Some of the factors which cause such variations are:

Foundations conditions
Vertical clearances for railroad tracks, etc.
Arrangement of cross section to keep street obstructions to a minimum

On the basis of these variations and after making preliminary designs of the structures involved, the following unit costs are typical of those used in the estimate.

	Per Sq. Ft.	Per Lin.Ft.
Bay Street - 6-lane viaduct	$5.50	$400.00
Embarcadero - 6-lane viaduct	8.23	600.00

The estimates, by sections, of the Marginal Freeway is shown by Table VII-6.

The following comments may be made on these estimates for those portions south of Islais Creek. Reference is made to the "Memorandum on Tideland Reclamation" of the City Planning Commission, dated June 6, 1945. In that memorandum the amount of $684,000 was developed as the cost of the Freeway right of way filled to grade for the portion between Third and Galvez Streets, and $610,000 for that portion between Spear and Ingerson Streets. For these sections, therefore, the only construction costs involved, assuming that the construction proceeds along with the Tideland Reclamation, is the cost of paving and lighting. Similarly, the most economical locations to secure the fill required for this reclamation are portions of Hunters and Candlestick Point. Since the fill has been included in the cost of the right of way no additional estimate has been made for the cost of excavating the cuts through these two hills.

No allowance has been made for right of way along the Embarcadero except where private property is required on either side of the Ferry Building. The estimates include allowances for the limited shifting of railroad tracks which will be necessary.

The estimated average cost per mile of the six-lane Freeway is:

	Total	Per Lane Mile
Construction	$2,810,000	$469,000
Property	580,000	97,000
Total	$3,390,000	$566,000

[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [

The San Francisco-Oakland Bay Bridge has the equivalent of 11 traffic lanes; its length is 8.9 miles; its cost was $80,000,000. The cost per lane mile reduces to $870,000. On the basis of present day costs, this would increase about 50 per cent, or to $1,300,000 per lane mile.

In the costs of the Freeway, not only the cost of construction, but those of maintenance must be considered. The estimate of these annual charges is as follows:

Maintenance - Painting	$30,000
Other	10,000
Lift bridge operation	50,000
Tunnel operation	20,000
Lighting	30,000
	$140,000

Again, for comparison, the annual maintenance charges on the Bay Bridge (excluding toll collection and insurance) average $300,000.

The costs of property have been estimated by ascertaining the assessed valuation thereof and applying a factor, which in past practice has proven adequate, thereto. Prints of Drawings 6 - 11, inclusive, with the property requirements and estimated costs of acquisition have been filed with the City Planning Commission.

TABLE VII-1

Indices of Construction Cost
1913 = 100

Year	E.N.R.	A.G.C.	I.C.C.	T.C.C.	Ave.	1945 =100
1903	93.9					37
1904	87.4					35
1905	90.6					36
1906	95.1					38
1907	100.6					40
1908	97.2					39
1909	90.9					36
1910	96.3					38
1911	93.4					37
1912	90.7					36
1913	100.00	100	100	100	100	40
1914	88.6	99	100	100	97	39
1915	92.6	100	101	103	99	40
1916	129.6	114	115	120	120	48
1917	181.2	152	135	147	154	62
1918	189.2	175	154	166	174	70
1919	198.4	198	185	196	194	78
1920	251.3	247	215	252	241	98
1921	201.8	200	192	183	196	78
1922	174.4	184	180	175	178	71
1923	214.1	201	194	196	201	80
1924	215.4	202	193	194	201	80
1925	206.7	199	188	195	197	79
1926	208.0	197	184	195	196	79
1927	206.2	200	189	190	196	79
1928	206.8	199	188	190	196	79
1929	207.0	203	187	185	196	79
1930	202.8	200	182	165	188	75
1931	181.4	196	165	145	172	69
1932	157.0	171	141	136	151	61
1933	170.2	163	145	140	154	62
1934	198.1	178	151	160	172	69
1935	196.4	176	151	162	171	69
1936	206.4	179	157	169	178	71
1937	234.7	188	166	192	195	78
1938	235.9	189	166	188	195	78
1939	235.5	188	166	182	193	77
1940	242.0	189	177	193	200	80
1941	257.8	198	188	215	215	86
1942	276.3	209	208	245	235	90
1943	290.0	216	219	257	245	98
1944	298.6	223	221	244	246	98
1945	300				250	100

Notes: E.N.R. - Engineering News Record
A.G.C. - Associated General Contractors
I.C.C. - Interstate Commerce Commission
T.C.C. - Turner Construction Company

Tableau de Concordance de Rang
Y(1) = f(x)

Rang	E.S.E.	Ajust.	S.Ajust.	T.S.S.	Ajust.	Rang
1940						1940
1941	93.9					37
1942	91.4					39
1943	90.0					34
1944	90.1					38
1945	100.6					40
1946	92.3					36
1947	90.9					35
1948	90.3					33
1949	93.4					37
1950	90.7					34
1951	100.00	100	100	100	100	40
1952	98.6	99	100	100	99	39
1953	95.6	100	100	103	99	40
1954	109.8	124	119	120	120	47
1955	101.2	120	124	127	124	43
1956	109.7	123	124	126	124	44
1957	104.4	124	124	125	124	44
1958	102.3	121	122	123	122	43
1959	103.6	120	120	122	120	42
1960	104.4	124	120	119	120	42
1961	104.3	120	120	120	120	42
1962	104.7	120	120	120	120	42
1963	107.0	120	120	120	120	42
1964	104.4	120	120	120	120	42
1965	104.7	120	120	120	120	42
1966	104.3	120	120	120	120	42
1967	104.9	120	120	120	120	42
1968	104.3	120	120	120	120	42
1969	107.0	120	120	120	120	42
1970	104.9	120	120	120	120	42
1971	104.4	120	120	120	120	42
1972	107.0	120	120	120	120	42
1973	109.5	120	120	120	120	42
1974	104.2	120	120	120	120	42
1975	104.7	120	120	120	120	42
1976	108.0	120	120	120	120	42
1977	104.9	120	120	120	120	42
1978	104.3	120	120	120	120	42
1979	107.0	120	120	120	120	42
1980	105.9	120	120	120	120	42
1981	103.4	120	120	120	120	42
1982	107.0	120	120	120	120	42
1983	109.5	120	120	120	120	42
1984	104.2	120	120	120	120	42
1985	104.7	120	120	120	120	42
1986	104.4	120	120	120	120	42
1987	104.7	120	120	120	120	42
1988	105.9	120	120	120	120	42
1989	104.2	120	120	120	120	42
1990	104.7	120	120	120	120	42
1991	104.4	120	120	120	120	42
1992	104.7	120	120	120	120	42
1993	109.5	120	120	120	120	42
1994	104.2	120	120	120	120	42
1995	104.7	120	120	120	120	42
1996	104.4	120	120	120	120	42
1997	104.7	120	120	120	120	42
1998	105.9	120	120	120	120	42
1999	104.2	120	120	120	120	42
2000	104.7	120	120	120	120	42
2001	104.4	120	120	120	120	42
2002	104.7	120	120	120	120	42
2003	109.5	120	120	120	120	42
2004	104.2	120	120	120	120	42
2005	104.7	120	120	120	120	42
2006	104.4	120	120	120	120	42
2007	104.7	120	120	120	120	42
2008	105.9	120	120	120	120	42
2009	104.2	120	120	120	120	42
2010	104.7	120	120	120	120	42
2011	104.4	120	120	120	120	42
2012	104.7	120	120	120	120	42
2013	109.5	120	120	120	120	42
2014	104.2	120	120	120	120	42
2015	104.7	120	120	120	120	42
2016	104.4	120	120	120	120	42
2017	104.7	120	120	120	120	42
2018	105.9	120	120	120	120	42
2019	104.2	120	120	120	120	42
2020	104.7	120	120	120	120	42
2021	104.4	120	120	120	120	42
2022	104.7	120	120	120	120	42
2023	109.5	120	120	120	120	42
2024	104.2	120	120	120	120	42
2025	104.7	120	120	120	120	42
2026	104.4	120	120	120	120	42
2027	104.7	120	120	120	120	42
2028	105.9	120	120	120	120	42
2029	104.2	120	120	120	120	42
2030	104.7	120	120	120	120	42
2031	104.4	120	120	120	120	42
2032	104.7	120	120	120	120	42
2033	109.5	120	120	120	120	42
2034	104.2	120	120	120	120	42
2035	104.7	120	120	120	120	42
2036	104.4	120	120	120	120	42
2037	104.7	120	120	120	120	42
2038	105.9	120	120	120	120	42
2039	104.2	120	120	120	120	42
2040	104.7	120	120	120	120	42
2041	104.4	120	120	120	120	42
2042	104.7	120	120	120	120	42
2043	109.5	120	120	120	120	42
2044	104.2	120	120	120	120	42
2045	104.7	120	120	120	120	42
2046	104.4	120	120	120	120	42
2047	104.7	120	120	120	120	42
2048	105.9	120	120	120	120	42
2049	104.2	120	120	120	120	42
2050	104.7	120	120	120	120	42
2051	104.4	120	120	120	120	42
2052	104.7	120	120	120	120	42
2053	109.5	120	120	120	120	42
2054	104.2	120	120	120	120	42
2055	104.7	120	120	120	120	42
2056	104.4	120	120	120	120	42
2057	104.7	120	120	120	120	42
2058	105.9	120	120	120	120	42
2059	104.2	120	120	120	120	42
2060	104.7	120	120	120	120	42
2061	104.4	120	120	120	120	42
2062	104.7	120	120	120	120	42
2063	109.5	120	120	120	120	42
2064	104.2	120	120	120	120	42
2065	104.7	120	120	120	120	42
2066	104.4	120	120	120	120	42
2067	104.7	120	120	120	120	42
2068	105.9	120	120	120	120	42
2069	104.2	120	120	120	120	42
2070	104.7	120	120	120	120	42
2071	104.4	120	120	120	120	42
2072	104.7	120	120	120	120	42
2073	109.5	120	120	120	120	42
2074	104.2	120	120	120	120	42
2075	104.7	120	120	120	120	42
2076	104.4	120	120	120	120	42
2077	104.7	120	120	120	120	42
2078	105.9	120	120	120	120	42
2079	104.2	120	120	120	120	42
2080	104.7	120	120	120	120	42
2081	104.4	120	120	120	120	42
2082	104.7	120	120	120	120	42
2083	109.5	120	120	120	120	42
2084	104.2	120	120	120	120	42
2085	104.7	120	120	120	120	42
2086	104.4	120	120	120	120	42
2087	104.7	120	120	120	120	42
2088	105.9	120	120	120	120	42
2089	104.2	120	120	120	120	42
2090	104.7	120	120	120	120	42
2091	104.4	120	120	120	120	42
2092	104.7	120	120	120	120	42
2093	109.5	120	120	120	120	42
2094	104.2	120	120	120	120	42
2095	104.7	120	120	120	120	42
2096	104.4	120	120	120	120	42
2097	104.7	120	120	120	120	42
2098	105.9	120	120	120	120	42
2099	104.2	120	120	120	120	42
2100	104.7	120	120	120	120	42
2101	104.4	120	120	120	120	42
2102	104.7	120	120	120	120	42
2103	109.5	120	120	120	120	42
2104	104.2	120	120	120	120	42
2105	104.7	120	120	120	120	42
2106	104.4	120	120	120	120	42
2107	104.7	120	120	120	120	42
2108	105.9	120	120	120	120	42
2109	104.2	120	120	120	120	42
2110	104.7	120	120	120	120	42
2111	104.4	120	120	120	120	42
2112	104.7	120	120	120	120	42
2113	109.5	120	120	120	120	42
2114	104.2	120	120	120	120	42
2115	104.7	120	120	120	120	42
2116	104.4	120	120	120	120	42
2117	104.7	120	120	120	120	42
2118	105.9	120	120	120	120	42
2119	104.2	120	120	120	120	42
2120	104.7	120	120	120	120	42
2121	104.4	120	120	120	120	42
2122	104.7	120	120	120	120	42
2123	109.5	120	120	120	120	42
2124	104.2	120	120	120	120	42
2125	104.7	120	120	120	120	42
2126	104.4	120	120	120	120	42
2127	104.7	120	120	120	120	42
2128	105.9	120	120	120	120	42
2129	104.2	120	120	120	120	42
2130	104.7	120	120	120	120	42
2131	104.4	120	120	120	120	42
2132	104.7	120	120	120	120	42
2133	109.5	120	120	120	120	42
2134	104.2	120	120	120	120	42
2135	104.7	120	120	120	120	42
2136	104.4	120	120	120	120	42
2137	104.7	120	120	120	120	42
2138	105.9	120	120	120	120	42
2139	104.2	120	120	120	120	42
2140	104.7	120	120	120	120	42
2141	104.4	120	120	120	120	42
2142	104.7	120	120	120	120	42
2143	109.5	120	120	120	120	42
2144	104.2	120	120	120	120	42
2145	104.7	120	120	120	120	42
2146	104.4	120	120	120	120	42
2147	104.7	120	120	120	120	42
2148	105.9	120	120	120	120	42
2149	104.2	120	120	120	120	42
2150	104.7	120	120	120	120	42
2151	104.4	120	120	120	120	42
2152	104.7	120	120	120	120	42
2153	109.5	120	120	120	120	42
2154	104.2	120	120	120	120	42
2155	104.7	120	120	120	120	42
2156	104.4	120	120	120	120	42
2157	104.7	120	120	120	120	42
2158	105.9	120	120	120	120	42
2159	104.2	120	120	120	120	42
2160	104.7	120	120	120	120	42
2161	104.4	120	120	120	120	42
2162	104.7	120	120	120	120	42
2163	109.5	120	120	120	120	42
2164	104.2	120	120	120	120	42
2165	104.7	120	120	120	120	42
2166	104.4	120	120	120	120	42
2167	104.7	120	120	120	120	42
2168	105.9	120	120	120	120	42
2169	104.2	120	120	120	120	42
2170	104.7	120	120	120	120	42
2171	104.4	120	120	120	120	42
2172	104.7	120	120	120	120	42
2173	109.5	120	120	120	120	42
2174	104.2	120	120	120	120	42
2175	104.7	120	120	120	120	42
2176	104.4	120	120	120	120	42
2177	104.7	120	120	120	120	42
2178	105.9	120	120	120	120	42
2179	104.2	120	120	120	120	42
2180	104.7	120	120	120	120	42
2181	104.4	120	120	120	120	42
2182	104.7	120	120	120	120	42
2183	109.5	120	120	120	120	42
2184	104.2	120	120	120	120	42
2185	104.7	120	120	120	120	42
2186	104.4	120	120	120	120	42
2187	104.7	120	120	120	120	42
2188	105.9	120	120	120	120	42
2189	104.2	120	120	120	120	42
2190	104.7	120	120	120	120	42
2191	104.4	120	120	120	120	42
2192	104.7	120	120	120	120	42
2193	109.5	120	120	120	120	42
2194	104.2	120	120	120	120	42
2195	104.7	120	120	120	120	42
2196	104.4	120	120	120	120	42
2197	104.7	120	120	120	120	42
2198	105.9	120	120	120	120	42
2199	104.2	120	120	120	120	42
2200	104.7	120	120	120	120	42
2201	104.4	120	120	120	120	42
2202	104.7	120	120	120	120	42
2203	109.5	120	120	120	120	42
2204	104.2	120	120	120	120	42
2205	104.7	120	120	120	120	42
2206	104.4	120	120	120	120	42
2207	104.7	120	120	120	120	42
2208	105.9	120	120	120	120	42
2209	104.2	120	120	120	120	42
2210	104.7	120	120	120	120	42
2211	104.4	120	120	120	120	42
2212	104.7	120	120	120	120	42
2213	109.5	120	120	120	120	42
2214	104.2	120	120	120	120	42
2215	104.7	120	120	120	120	42
2216	104.4	120	120	120	120	42
2217	104.7	120	120	120	120	42
2218	105.9	120	120	120	120	42
2219	104.2	120	120	120	120	42
2220	104.7	120	120	120	120	42
2221	104.4	120	120	120	120	42
2222	104.7	120	120	120	120	42
2223	109.5	120	120	120	120	42
2224	104.2	120	120	120	120	42
2225	104.7	120	120	120	120	42
2226	104.4	120	120	120	120	42
2227	104.7	120	120	120	120	42
2228	105.9	120	120	120	120	42
2229	104.2	120	120	120	120	42
2230	104.7	120	120	120	120	42
2231	104.4	120	120	120	120	42
2232	104.7	120	120	120	120	42
2233	109.5	120	120	120	120	42
2234	104.2	120	120	120	120	42
2235	104.7	120	120	120	120	42
2236	104.4	120	120	120	120	42
2237	104.7	120	120	120	120	42
2238	105.9	120	120	120	120	42
2239	104.2	120	120	120	120	42
2240	104.7	120	120	120	120	42
2241	104.4	120	120	120	120	42
2242	104.7	120	120	120	120	42
2243	109.5	120	120	120	120	42
2244	104.2	120	120	120	120	42
2245	104.7	120	120	120	120	42
2246	104.4	120	120	120	120	42
2247	104.7	120	120	120	120	42
2248	105.9	120	120	120	120	42
2249	104.2	120	120	120	120	42
2250	104.7	120	120	120	120	42
2251	104.4	120	120	120	120	42
2252	104.7	120	120	120	120	42
2253	109.5	120	120	120	120	42
2254	104.2	120	120	120	120	42
2255	104.7	120	120	120	120	42
2256	104.4	120	120	120	120	42
2257	104.7	120	120	120	120	42
2258	105.9	120	120	120	120	42
2259	104.2	120	120	120	120	42
2260	104.7	120	120	120	120	42
2261	104.4	120	120	120	120	42
2262	104.7	120	120	120	120	42
2263	109.5	120	120	120	120	42
2264	104.2	120	120	120	120	42
2265	104.7	120	120	120	120	42
2266	104.4	120	120	120	120	42
2267	104.7	120	120	120	120	42
2268	105.9	120	120	120	120	42
2269	104.2	120	120	120	120	42
2270	104.7	120	120	120	120	42
2271	104.4	120	120	120	120	42
2272	104.7	120	120	120	120	42
2273	109.5	120	120	120	120	42
2274	104.2	120	120	120	120	42
2275	104.7	120	120	120	120	42
2276	104.4	120	120	120	120	42
2277	104.7	120	120	120	120	42
2278	105.9	120	120	120	120	42
2279	104.2	120	120	120	120	42
2280	104.7	120	120	120	120	42
2281	104.4	120	120	120	120	42
2282	104.7	120	120	120	120	42
2283	109.5	120	120	120	120	42
2284	104.2	120	120	120	120	42
2285	104.7	120	120	120	120	42
2286	104.4	120	120	120	120	42
2287	104.7	120	120	120	120	42
2288	105.9	120	120	120	120	42
2289	104.2	120	120	120	120	42
2290	104.7	120	120	120	120	42
2291	104.4	120	120	120	120	42
2292	104.7	120	120	120	120	42
2293	109.5	120	120	120	120	42
2294	104.2	120	120	120	120	42
2295	104.7	120	120	120	120	42
2296	104.4	120	120	120	120	42
2297	104.7	120	120	120	120	42
2298	105.9	120	120	120	120	42
2299	104.2	120	120	120	120	42
2300	104.7	120	120	120	120	42
2301	104.4	120	120	120	120	42
2302	104.7	120	120	120	120	42
2303	109.5	120	120	120	120	42
2304	104.2	120	120	120	120	42
2305	104.7	120	120	120	120	42
2306	104.4	120	120	120	120	42
2307	104.7	120	120	120	120	42
2308	105.9	120	120	120	120	42
2309	104.2	120	120	120	120	42
2310	104.7	120	120	120	120	42
2311	104.4	120	120	120	120	42
2312	104.7	120	120	120	120	42
2313	109.5	120	120	120	120	42
2314	104.2	120	120	120	120	42
2315	104.7	120	120	120	120	42
2316	104.4	120	120	120	120	42
2317	104.7	120	120	120	120	42
2318	105.9	120	120	120	120	42
2319	104.2	120	120	120	120	42
2320	104.7	120	120	120	120	42
2321	104.4	120	120	120	120	42
2322	104.7	120	120	120	120	42
2323	109.5	120	120	120	120	42
2324	104.2	120	120	120	120	42
2325	104.7	120	120	120	120	42
2326	104.4	120	120	120	120	42
2327	104.7	120	120	120	120	42
2328	105.9	120	120	120	120	42
2329	104.2	120	120	120	120	42
2330	104.7	120	120	120	120	42
2331	104.4	120	120	120	120	42
2332	104.7	120	120	120	120	42
2333	109.5	120	120	120	120	42
2334	104.2	120	120	120	120	42
2335	104.7	120	120	120	120	42
2336	104.4	120	120	120	120	42
2337	104.7	120	120	120	120	42
2338	105.9	120	120	120	120	42
2339	104.2	120	120	120	120	42
2340	104.7	120	120	120	120	42
2341	104.4	120	120	120	120	42
2342	104.7	120	120	120	120	42
2343	109.5	120	120	120	120	42
2344	104.2	120	120	120	120	42
2345	104.7	120	120	120	120	42
2346	104.4	120	120	120	120	42
2347	104.7	120	120	120	120	42
2348	105.9	120	120	120	120	42
2349	104.2	120	120	120	120	42
2350	104.7	120	120	120	120	42
2351	104.4	120	120	120	120	42
2352	104.7	120	120	120	120	42
2353	109.5	120	120	120	120	42
2354	104.2	120	120	120	120	42
2355	104.7	120	120	120	120	42
2356	104.4	120	120	120	120	42
2357	104.7	120	120	120	120	42
2358	105.9	120	120	120	120	42
2359	104.2	120	120	120	120	42
2360	104.7	120	120	120	120	42
2361	104.4	120	120	120	120	42
2362	104.7	120	120	120	120	42
2363	109.5	120	120	120	120	42
2364	104.2	120	120	120	120	42
2365	104.7	120	120	120	120	42
2366	104.4	120	120	120	120	42
2367	104.7	120	120	120	120	42
2368	105.9	120	120	120	120	42
2369	104.2	120	120	120	120	42
2370	104.7	120	120	120	120	42
2371	104.4	120	120	120	120	42
2372	104.7	120	120	120	120	42
2373	109.5	120	120	120	120	42
2374	104.2	120	120	120	120	42
2375	104.7	120	120	120	120	42
2376	104.4	120	120	120	120	42
2377	104.7	120	120	120	120	42
2378	105.9	120	120	120	120	42
2379	104.2	120	120	120	120	42
2380	104.7	120	120	120	120	42
2381	104.4	120	120	120	120	42
2382	104.7	120	120	120	120	42
2383	109.5	120	120	120	120	42
2384	104.2	120	120	120	120	42
2385	104.7	120	120	120	120	42
2386	104.4	120	120	120	120	42
2387	104.7	120	120	120	120	42
2388	105.9	120	120	120	120	42
2389	104.2	120	120	120	120	42
2390	104.7	120	120	120	120	42
2391	104.4	120	120	120	120	42
2392	104.7	120	120	120	120	42
2393	109.5	120	120	120	120	42
2394	104.2	120	120	120	120	42
2395	104.7	120	120	120	120	42
2396	104.4	120	120	120	120	42
2397	104.7	120	120	120	120	42
2398	105.9	120	120	120	120	42
2399	104.2	120	120	120	120	42
2400	104.7	120	120	120	120	42
2401	104.4	120	120	120	120	42
2402	104.7	120	120	120	120	42
2403	109.5	120	120	120	120	42
2404	104.2	120	120	120	120	42
2405	104.7	120	120	120	120	42
2406	104.4	120	120	120	120	42
2407	104.7	120	120	120	120	42
2408	105.9	120	120	120	120	42
2409	104.2	120	120	120	120	42
2410	104.7	120	120	120	120	42
2411	104.4	120	120	120	120	42
2412	104.7	120	120	120	120	42
2413	109.5	120	120	120	120	42
2414	104.2	120	120	120	120	42
2415	104.7	120	120	120	120	42
2416	104.4	120	120	120	120	42
2417	104.7	120	120	120	120	42
2418	105.9	120	120	120	120	42
2419	104.2	120	120	120	120	42
2420	104.7	120	120	120	120	42
2421	104.4	120	120	120	120	42
2422	104.7	120	120	120	120	42
2423	109.5	120	120	120	120	42
2424	104.2	120	120	120	120	42
2425	104.7

TABLE VII-2
Vehicular Tunnels Without Artificial Ventilation
Costs Per Square Foot

Tunnel and Location	Length Ft.	Clear Width Ft.	Year Built	Costs Total (a)	Costs Per Lin. Ft.	Costs Per Sq. Ft.	Costs Adj. to 1945	Notes
Stockton St., San Fran.	911	50O	1914	$ 415,000	$465	$ 9.30	$23.80	
Twin Peaks, San Fran.	11,926	25.0	1914	3,372,000	283	11.30	29.00	
Sunset, San Fran.	4,232	25.0	1926	1,247592	295	11.80	30.00	
Funstan Ave., San Fran.	1,300	49.9	1938	640,000	493	9.88	12.63	
Waldo Approach,Golden Gate Br.	1,000	47.0	1936	587,914	588	12.50	17.60	
Bay Bridge	540	129.0	1933	960,000	1,772	13.75	22.30	
Lake Washington, Seattle	2,932	28.9	1939	1,372,320	469	16.20		
Second St., Los Angeles	1,502		1924	1,004,000	668	13.36	16.70	
Figueroa St., Los Angeles	996	46.5	1930	458,400	465	10.00	13.35	
Hill St., Los Angeles	546	31.8	1913	126,000	230	7.25	18.20	
Sepulveda Blvd., Los Angeles	655	42.0	1929	218,200	334	7.95	10.05	
Belt Line R. R., San Fran.	1,500		1914	219,200	146			
Newhall, L. A. County	435	20.	1911	66,000	152	7.60	20.60	
Ferry Bldg., San Fran.	986	23.	1923	342,000	347	15.08	18.80	
Pac. Elec. Ry., Los Angeles	4,225	28.	1924	3,500,000	828	29.60	37.00	
Newcastle, Calif.	531	36.	1930	176,000	330	9.17	12.20	

TABLE VII-3
Vehicular Tunnels With Artificial Ventilation
Costs Per Square Foot

Tunnel and Location	Length Ft.	Clear Width Ft.	Year Built	Costs Total (a)	Costs Per Lin. Ft.	Costs Per Sq. Ft.	Costs Adj. to 1945	Notes
Oakland, Broadway	5,820	26.7	1934	$2,770,000	$475	$18.00	$26.00	(b)
Pennsylvania Turnpike	35,296	28.5	1938	16,000,000	450	15.80	20.20	(c)
Liberty, Pittsburgh, Pa.	11,550	26.6	1920	5,775,000	500	18.80	19.40	(d)
Wawona, Yosemite	4,230	28.0	1930	847,000	200	7.13	10.30	

Notes: (a) Not including property
(b) $725,000 chargeable to ventilation, $60,000 chargeable to lighting, 2 tubes @ 2910' = 5820'
(c) Length shown is aggregate for all tunnels on project
(d) 2 Tubes @ 5,775', Costs per lineal foot of tube, Construction $361, Ventilation $41, Extra $98

TABLE VII-4
Costs of Vehicular Bridges

Location	Length Ft.	Width Ft.	Costs Total	Costs Per Sq. Ft.	Year Built	Adj. to 1945	Notes
1. Conn. River, Middletown	3,420	45	$2,114,043	$13.75	1936	$19.40	Long Spans
2. Niles, Ohio, Grade Sep.	1,221	50	278,255	4.15	1932	6.80	
3. Rockaway Blvd., N. Y.	364	42	192,133	12.50	1931	18.10	
4. R.R.Overpass,Purcell Okla.	3,672	35	651,781	4.08	1937	5.24	
5. Conn.River,Turner Falls,Mass.	1,980	36	860,568	12.05	1937	14.15	Long Spans
6. Bureau of Public Roads Averages I beams on steel piers				4.00	1936	5.62	
7. Des Moines River,Ottumwa,Ia.	1,930	37	303,005	4.24	1935	6.12	
8. 6th St. Viaduct, Los Angeles	4,300	56	1,420,223	5.90	1931	8.60	
9. Turtle Ck., Rock Cty.,Wis.	531	45	115,152	4.80	1931	7.00	
10. Pulga, Calif.	680	24	150,000	9.20	1931	13.40	1-350' span
11. Ohio River,Evansville,Ind.	8,497	30	1,584,000	6.18	1931	9.00	
12. Ohio River, Ashland, Ky.	2,498	25	560,000	8.96	1930	12.00	
13. Wabash Ave., Chicago	400	100	516,000	12.90	1930	17.20	
14. E.4th St. Viaduct, Los Ang.	2,400	63	1,246,635	8.25	1930	11.00	
15. Akron, Ohio,Thornton St.	700	50	199,767	5.70	1930	7.60	
16. Salt River, West Point, Ky.	880	50	664,000	15.10	1941	17.55	

TABLE VII-5
Costs of Vehicular Bridges Movable

Location	Length	Width	Cost	Per Sq. Ft.	Year Built	Adj. to 1945
Chicago - Outer Drive	356	94	$1,591,327	$47.50	1931	$69.00
Summer St., Elizabeth, N.J.	100	36	146,445	40.60	1931	59.00
Wabash Ave., Chicago	250	79	670,000	34.00	1930	45.00
Biscayne, Miami, Fla.	120	44	288,377	55.00	1941	64.00
Chicago, No. State St.	300	90	1,854,000	69.00	1941	80.00

TABLE VII-6

THE MARGINAL FREEWAY

Lombard and Franklin Streets to Connection with Bayshore Freeway, South of County Line

ESTIMATE OF COST - SIX-LANE CONSTRUCTION

Section	Location	Length Feet	Description	Estimated Cost Construction	Property	Total
1	Franklin to Van Ness	390	Widen Streetto 146'	$ 60,000	$ 95,000	$ 155,000
2	Van Ness Ave. Bridge	120	Bridge over 4 traffic lanes	60,000	-	60,000
3	Van Ness Ave. Conns.	250	"On" E.B., "Off" W.B.	375,000	220,000	595,000
4	Van Ness to Columbus	1,900	1900' Tunnel	3,500,000	-	3,500,000
5	Columbus Ave. Conns.	380	"Off" E.B., "On" W.B.	350,000	260,000	610,000
6	Columbus to Stockton	2,070	Viaduct	850,000	560,000	1,410,000
7	Stockton St. Conns.	420	"On" E.B., "Off" W.B.	250,000	230,000	480,000
8	Grant to Sansome	1,500	Viaduct	700,000	-	700,000
9	Sansome St. Conns.	600	"Off" S.B. "On" N.B.	450,000	-	450,000
10	Sansome to Washington	3,540	Viaduct	2,200,000	-	2,200,000
11	Market St. Conns.	1,300	4 Way	1,200,000	1,000,000	2,200,000
	Subtotal	12,470		$9,995,000	$2,365,000	$12,360,000
12	Mission to Howard	850	Viaduct	$ 500,000	-	$ 500,000
13	Folsom St. Conns.	800	4 Way	700,000	60,000	760,000
14	Harrison to King	3,120	Viaduct	2,000,000	-	2,000,000
15	King St. Conns.	600	"On" N.B., "Off" S.B.	500,000	50,000	550,000
	Subtotal	5,370		$3,700,000	$ 110,000	$3,810,000
16	King St. to Channel	940	Viaduct	1,000,000	-	1,000,000
17	Bridge over Channel	150	Lift Span	1,000,000	-	1,000,000
18	Channel to 16th St.	3,830	Viaduct	2,700,000	125,000	2,825,000
19	Illinois St. Conns.	600	"On" N.B., "Off" S.B.	350,000	125,000	475,000
20	Illinois to Third	700	Viaduct	280,000	155,000	435,000
21	Third St. Conns.		"On" S.B., "Off" N.B.	60,000	-	60,000
22	Third St. Crossing	350	Bridge	250,000	$ -	250,000
	Subtotal	6,870		$5,640,000	$ 405,000	$6,045,000

TABLE VII-6
ESTIMATE OF COST - SIX LANE CONSTRUCTION - Cont.

Section	Location	Length Feet	Description	Estimated Cost Construction	Property	Total
23	Third to 21st	1,240	Depressed Way	$ 430,000	$ 280,000	$ 710,000
24	21st to Tulare	4,140	Viaduct	2,200,000	420,000	2,620,000
25	Islais Creek Bridge	150	Lift Span	1,000,000	-	1,000,000
26	Bridge to 3rd St.	430	Viaduct	450,000	20,000	470,000
27	3rd St. Conn.		"Off" S.B.	80,000	20,000	100,000
28	3rd to Mendell	1,700	Viaduct	850,000	-	850,000
29	Newhall St. Conn.		"On" N.B.	120,000	-	120,000
	Subtotal	7,660		$ 5,130,000	$ 740,000	$5,870,000
30	Mendell to India	2,020	Grade	$ 140,000	$ 460,000	$ 600,000
31	India St. Conns.		4 Way	20,000	-	20,000
32	India to Galvez	1,100	Grade	100,000	-	100,000
33	Galvez St. Conns.		"on" N.B., "Off" S.B.	50,000	225,000	275,000
	Subtotal	3,120		$ 310,000	$ 685,000	$ 995,000
34	Galvez to Spear	4,520	Cut	$ 230,000	$ 150,000	$ 380,000
35	Spear St. Conns.		4 Way	50,000	50,000	100,000
36	Spear to Ingerson	5,150	Grade	260,000	610,000	870,000
37	Ingerson St. Conns.		4 Way	50,000	-	50,000
38	Ingersonto County Line	2,680	Grade Cut	140,000	-	140,000
39	County Line to B.S. Freeway	1,820	Grade Cut	100,000	200,000	300,000
40	Freeway Conns.			50,000	-	50,000
	Subtotal	14,170		$ 880,000	$ 1,010,000	$1,890,000
	Total	49,360		$25,655,000	$ 5,315,000	$30,970,000
		9.16 miles	Per Mile	$ 2,810,000	$ 580,000	$ 3,390,000

VIII. FINANCING

At the turn of the century city streets were more than adequate for the horse and buggy and for the horse-drawn truck. They had excess capacity available for the motor car. Outside of urban areas, there were only dirt roads. To a very large extent these conditions have determined the road building progress in this country.

The first step was to connect the urban centers with surfaced roads permitting access between them. The "farm to market" program followed. The result is a rural highway system which requires maintenance and enlargement to the extent of interurban freeways as vehicular traffic increases but which, as compared to conditions in urban areas, is sufficient for its intended purpose.

In the meantime, in many cities there has been little change from the days of the horse and buggy. Streets have been widened to some extent and the character of the paving may have been improved, but the general street pattern has been unchanged. As the urban highways found more traffic into the city, these streets have been required to absorb more and more traffic with the result that in the central section of the cities, the volume of traffic reached, and exceeded, the capacity of the streets.

Faced with these conditions and spurred by P.W.A. assistance several cities started, fifteen years ago, a system of Express Highways. At that time, the cities share of the cost was principally met by direct taxation. At the present time most cities are faced with the necessity of major improvements in transportation facilities and are groping for means of financing.

Among the possibilities in this connection the following have been mentioned:

1. Federal Financing

We are unable to give any predictions as to Federal grants which may be forthcoming as a result of the proposed "Full Employment" bill or similar measures. However, it would appear advisable that any city have plans and specifications ready to take full advantage of such funds should they be made available.

The above is, of course, separate from and above funds that may be available through the Federal Road Administration and distributed through the various State Highway Departments.

[illegible]

[illegible] the form of the country city planners were more than merely the [illegible] and [illegible] transportation lines. They had become especially available for the entire use. Outside of these areas, there were only dirt roads. In a very large number [illegible] conditions have developed the road facilities necessary to this country.

The first step was to connect the urban centers with another [illegible] existing between them. [illegible] is needed" engineers [illegible]. The result is a novel highway system which minimizes [illegible] and encroachment on the wealth of industrial [illegible] traffic [illegible] not wanted, or economic to [illegible] to urban areas, is sufficient for its intended purpose.

In the meantime, in many cities there have been drastic changes [illegible] days of the horse and buggy. Streets have been widened to some extent and the elevation of the [illegible] may be improved, but the general street pattern has been unchanged. As the urban [illegible] moved more traffic into the city, there streets have been required to absorb more and more traffic with the result that in the central [illegible] ring of the cities, the volume of traffic traveled, and consequently [illegible] of the streets.

Faced with these conditions and planned by F.W.A. [illegible] several cities started, Cities Point also, a system of [illegible]. At that time, the cities known of the most modernly was to divert [illegible]. At the present time most cities are faced with the necessity of [illegible] transportation facilities and are creating for means of [illegible].

[illegible] the possibilities in this connection the following have been mentioned:

1. [illegible]

We are unable to give any prediction as to [illegible] which may be [illegible] as a result of the proposed "Rail Improvement" [illegible] or [illegible]. However, it would appear advisable that city have plans and specifications ready to take full advantage of [illegible] should they be made available.

The cities [illegible], of course, [illegible] from rail users [illegible] available through the Federal Road [illegible] and distributed through the various State [illegible].

2. Gasoline Tax

The motorist demands good roads. He has not objected to the gasoline tax in order to pay for them. At the last session of the State Legislature, a bill was introduced increasing the gasoline tax by 1-1/2 cents per gallon for Freeway construction. It appears probable that a similar bill will pass in the near future.

3. Tolls

San Francisco has two excellent examples of vehicular facilities on which tolls are charged. Tolls are charged on certain freeways, such as the Westchester Parkways and the Pennsylvania Turnpike. Suggestions have been made that freeways within cities be financed in a similar manner.

For interurban freeways, such proposals have possibilities. However, within cities, it is necessary to have entrancesand exits at rather frequent intervals. The cost of collecting tolls would be a very high percentage of the revenue and is not recommended.

The use of freeways would reduce operating costs for transit vehicles using the facilities. To this extent, some portion of operating revenues might be allocated for such purposes. On the other hand, since improved mass transportation facilities form the greatest opportunity in solving the traffic problem, it seems desirable that they be subsidized, at least to this extent.

4. Parking Facilities

The urgent need of additional parking facilities has been repeatedly mentioned in this report. It is preferable that the provision of such facilities be considered as an integral part of providing improved transportation facilities rather than as an isolated program.

The experience at the Union Square Garage and similar experiences in other cities indicate that suitably located parking facilities are not only self-liquidating but will provide excess funds which may be applied to the overall financial program.

While parking meters should be considered as a means of expediting business rather than as a source of revenues, their possibilities in the latter respect should not be overlooked.

3. Operation

The annotated schedule goes here. It may not be typed to the possible fun to undue it on the floor. At the last session of the Cruise Lapland-Wien, a full one thousand consecutive the gondola for by 1-1/2 cents per million for leaving reservations. It appears practicable that a similar full will take in the next Olympic.

4. Costs

The formulae for the accidental injuries of patients treated on which fells are charged. Tells are charged on certain fractures, such as the Pavlovian Jackson and the Zimmerbaum fracture. Questions have been made that lessons which differ is limited to a similar extent.

For instance fracture, such occasions have possibilities. Certain kinds of the accounts in some circumstances will be taken Treasonal Internals. The work of evaluation fells could be a very high percentage of the patients and is not inexpensive.

The use of Cassegra would require operating funds for Hospital outside using the facilities. In this event, fees payable to operating payments might be allowed for such services. On the other hand, those injured were transported facilities from the Hospital accordingly to relieve the health problem, it seems desirable that they be subsidized, at least in this sense.

5. Parking Facilities

The urgent need of additional parking facilities has been particularly emphasized in this report. It is practicable that the provision of such facilities be considered as an integral part of providing improved transportation facilities rather than as separate problems.

The experience of the Swiss Alpine Garage and similar enterprises in other nations indicate that multiple decked parking facilities are not only self-liquidating but will provide income which may be applied to the overall financial picture.

Multiple parking should be considered as a means of expediting business rather than as a source of revenue. Under favorable circumstances the latter result may be developed.

5. Direct Taxation

Improved traffic facilities in any city reduce the costs of doing business and directly benefits all parts of the city. To this extent, part of the costs of such improvements should, in equity, be spread by means of direct taxation. In practice, because of the increased activities undertaken by city authorities, direct taxation has reached such high levels that further increases meet with considerable opposition.

Onthe basis of the foregoing, we believe that the main reliance for financing the Marginal Freeway, as well as the other major vehicular facilities so badly-needed in San Francisco, must be on an increase in the gasoline tax. The city should be prepared to take advantage of any Federal financing which may become available.

IX. FURTHER PROCEDURE

The limitations of this report were stated in Section I. It is again emphasized that it is only preliminary in its nature and will have little value unless it is followed by the work outlined below.

1. The report should be reviewed in detail by the Public Works Department. If the engineers of such Department agree that the project is one that will prove necessary, such Department should:

   a. Study the location in detail to ascertain any savings that may be made possible by minor changes in location.

   b. Prepare layouts of the various structures and connections in sufficient detail to determine the property that will be required.

   c. Take the necessary steps to "protect" such property in order that expensive improvements thereto will not seriously increase the costs of property acquisition. Arrangements should be made that any revisions in tracks simplify rather than complicate the proposed construction.

2. A report, dated June 6, 1945, on the Reclamation of Tidelands was made by the Director of Planning. In this connection, considerable quantities of fill will be required. The most economical location to secure this fill will be the site of the temporary housing west of the Navy Yard.

   This entire matter should receive comprehensive study by all City, State and Federal authorities directly concerned.

3. Consideration should be given by all City Departments concerned to the financing not only of the Marginal Freeway, but of other transportation facilities so that intelligent publicity can be provided, and concerted action taken for such legislation as may be necessary.

X. ACKNOWLEDGMENTS

The writers acknowledge their debt to those who have furnished data and who have given freely of their time in discussing several of the problems which have been encountered.

The members of the City Planning Commission have discussed the preliminary reports which have been presented. Their opinions have been helpful in the preparation of the present Report.

Members of the Staff of the Commission, Mr. L. Deming Tilton, Director of Planning; Mr. Bryant Hall, Senior Planner; Mr. Glenn Hall, Master Plan Designer; and Mr. Francis Violich have assisted in the editing of the Report. Their valuable comments and suggestions are appreciated.

Miss Barbara Borhet assembled data from the Assessor's Office which has been used in the estimates of property to be acquired.

Mr. Harry Vensono, Director of Public Works, and Mr. S. P. Duckel, Assistant City Engineer, have furnished data and expressed their ideas on several matters.

Mr. Frank White, Chief Engineer of the State Board of Harbor Commissioners, furnished detail maps of the Embarcadero and also furnished information as to foundation conditions.

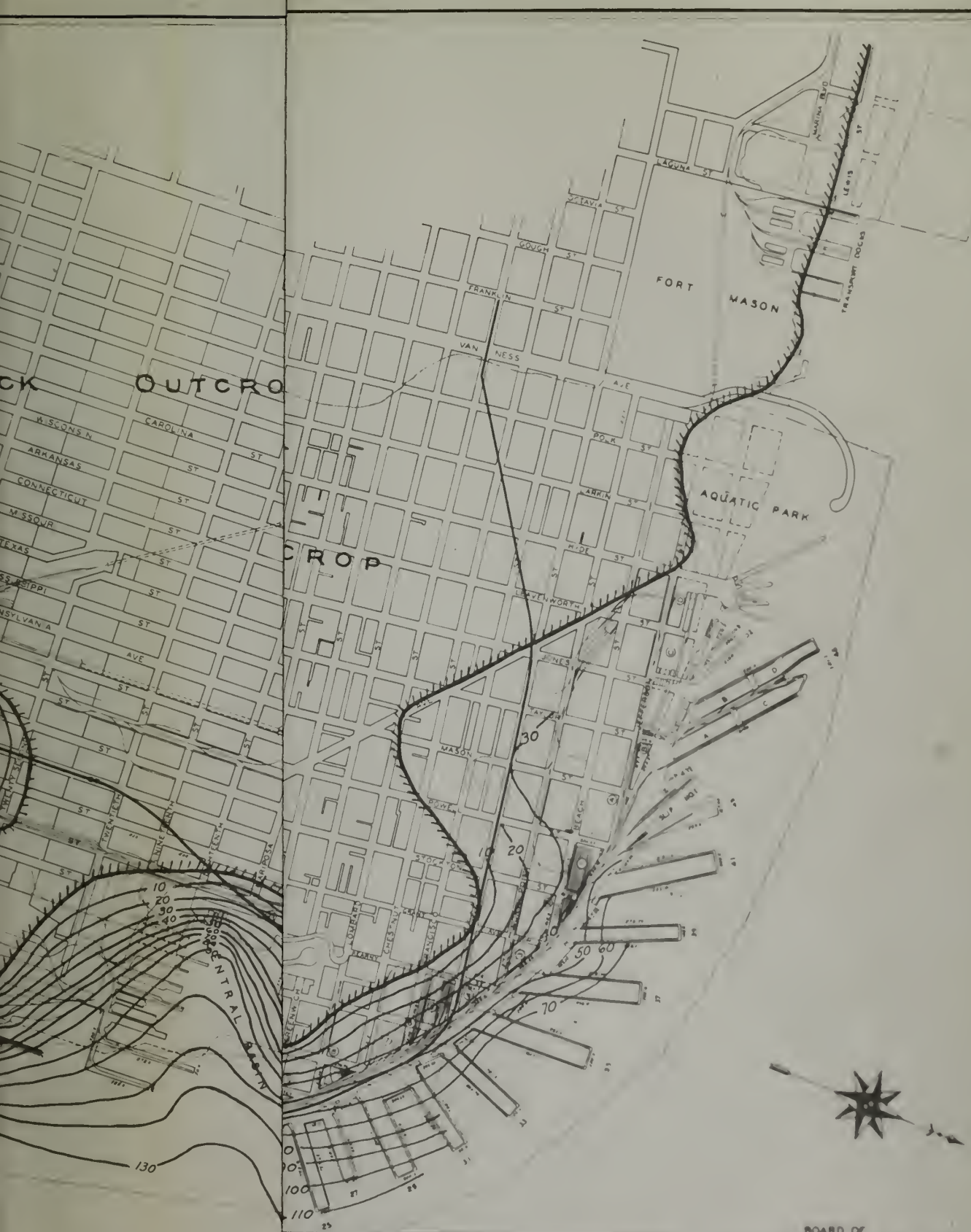
Mr. Charles J. Astrue, Assistant Chief Engineer of the Southern Pacific Company, furnished maps of all areas on which such company has tracks. This included most of the area involved in the recommended location.

The data in the McClintock report was invaluable in furnishing the data on which the traffic estimates were based.

Mr. Howard C. Wood, Principal Bridge Engineer, San Francisco-Oakland Bay Bridge, and Mr. James E. Picketts, Manager of the Golden Gate Bridge, furnished data as to the traffic over the two bridges. Foundation data secured during the construction of the Bay Bridge were also available.

Mr. A. F. MacLane, Engineer of Construction, Bethlehem Steel Company, furnished data in regard to subsurface conditions.

Most of the foundation data described in Section IV and reproduced on Drawing 2 was obtained from "Subsidence and the Foundation Problem in San Francisco", a report of the Subsoil Committee of the San Francisco Section, American Society of Civil Engineers, published September 1932.



BY	REVISION DESCRIPTION	DATE

WOODRUFF & SAMPSON
ENGINEERS
333 MONTGOMERY ST SAN FRANCISCO 4

CITY PLANNING COMMISSION
CITY & COUNTY OF SAN FRANCISCO

MARGINAL FREEWAY

CONTOURS OF HARD BOTTOM

MADE BY
CHECKED BY
APPROVED

SCALE .....
JOB NO. 4504
DATE AUG 30, 1945
DRAWING NO 2

BOARD OF
STATE HARBOR COMMISSIONERS
FOR SAN FRANCISCO HARBOR

MAP OF THE
WATER FRONT
OF
SAN FRANCISCO
1940

J.F. MARIAS
GEO. MENEMEYER
E.A. MC MILLAN
COMMISSIONERS

FRANK G. WHITE
CHIEF ENGINEER

1 INCH = 800 FEET

F R A

GOUGH ST

CITY HALL PLAZA

FORT MASON

AQUATIC PARK

BAY SHORE FREEWAY

MARGINAL FREEWAY

By Bay Shore Freeway
By Marginal Freeway 9½min 7.5

15mi/hr

10mi/hr

4 0mi/hr

Travel times are by Bay Shore Freeway to Sixth St. thence by Marginal Freeway. Add 2min. for entire trip by Marginal Freeway.

CHINA BASIN

F R A N C I S C O

TRAVEL TIMES FROM
COUNTY LINE TO CENTRAL BUSINESS DISTRICT
VIA
BAY SHORE & MARGINAL FREEWAYS

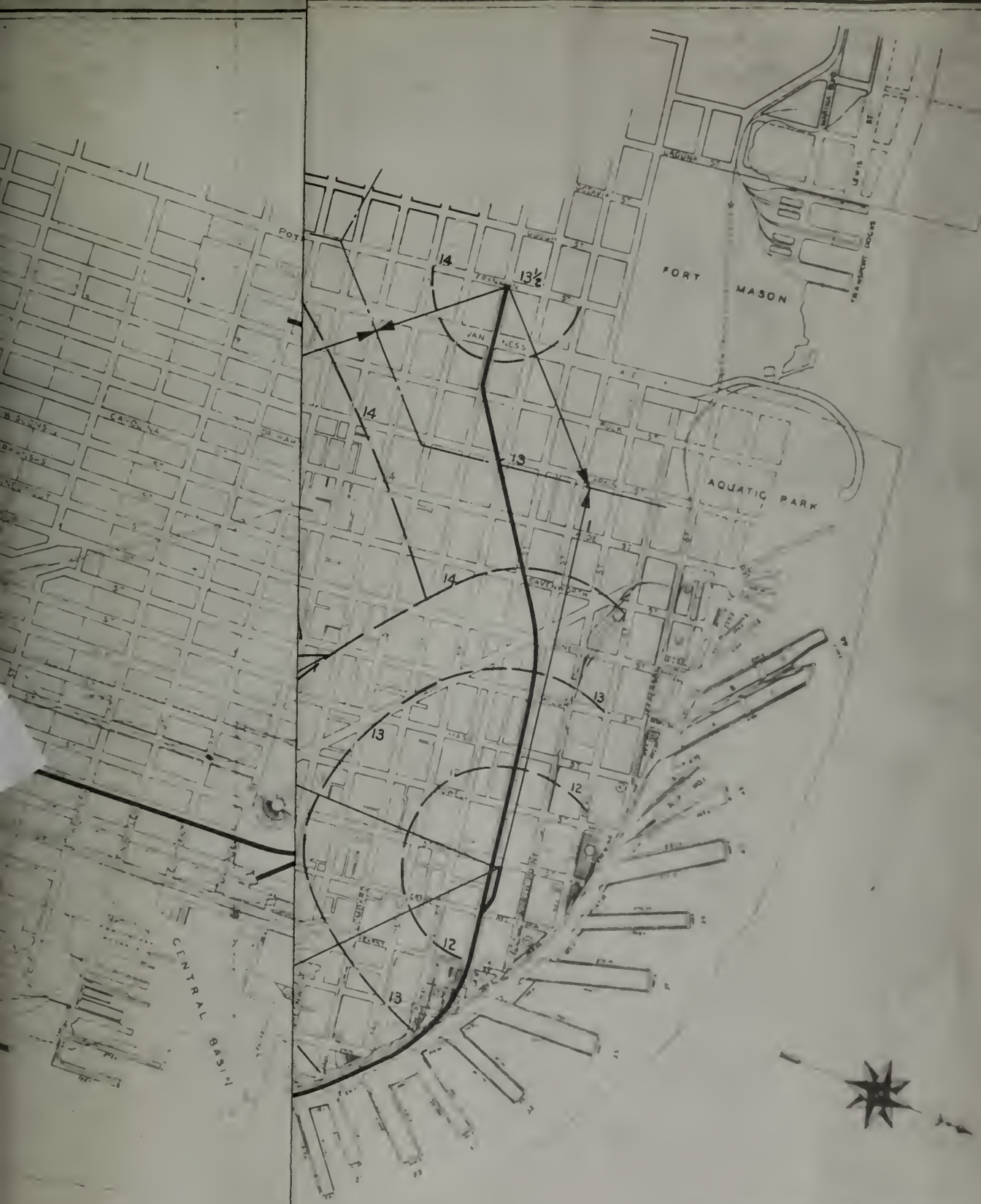
DRAWING 3

MARGINAL FREEWAY VIA CHINA BASIN

AUG 30,1945

BOARD OF
STATE HARBOR COMMISSIONERS
FOR SAN FRANCISCO HARBOR

MAP OF THE
WATER FRONT
OF
SAN FRANCISCO
1940



BOARD OF
STATE HARBOR COMMISSIONERS
FOR SAN FRANCISCO HARBOR

MAP OF THE
WATER FRONT
OF
SAN FRANCISCO
1940

MES FROM
RAL BUSINESS DISTRICT

F R A GINAL FREEWAYS

3

Y VIA CHINA BASIN

1945

BAY SHORE FREEWAY

GOUGH ST.

MARGINAL FREEWAY

40mi/hr.

15mi/hr.

10mi/hr.

FRANCISCO

TRAVEL TIMES FROM
COUNTY LINE TO CENTRAL BUSINESS DISTRICT
VIA
BAY SHORE & MARGINAL FREEWAYS

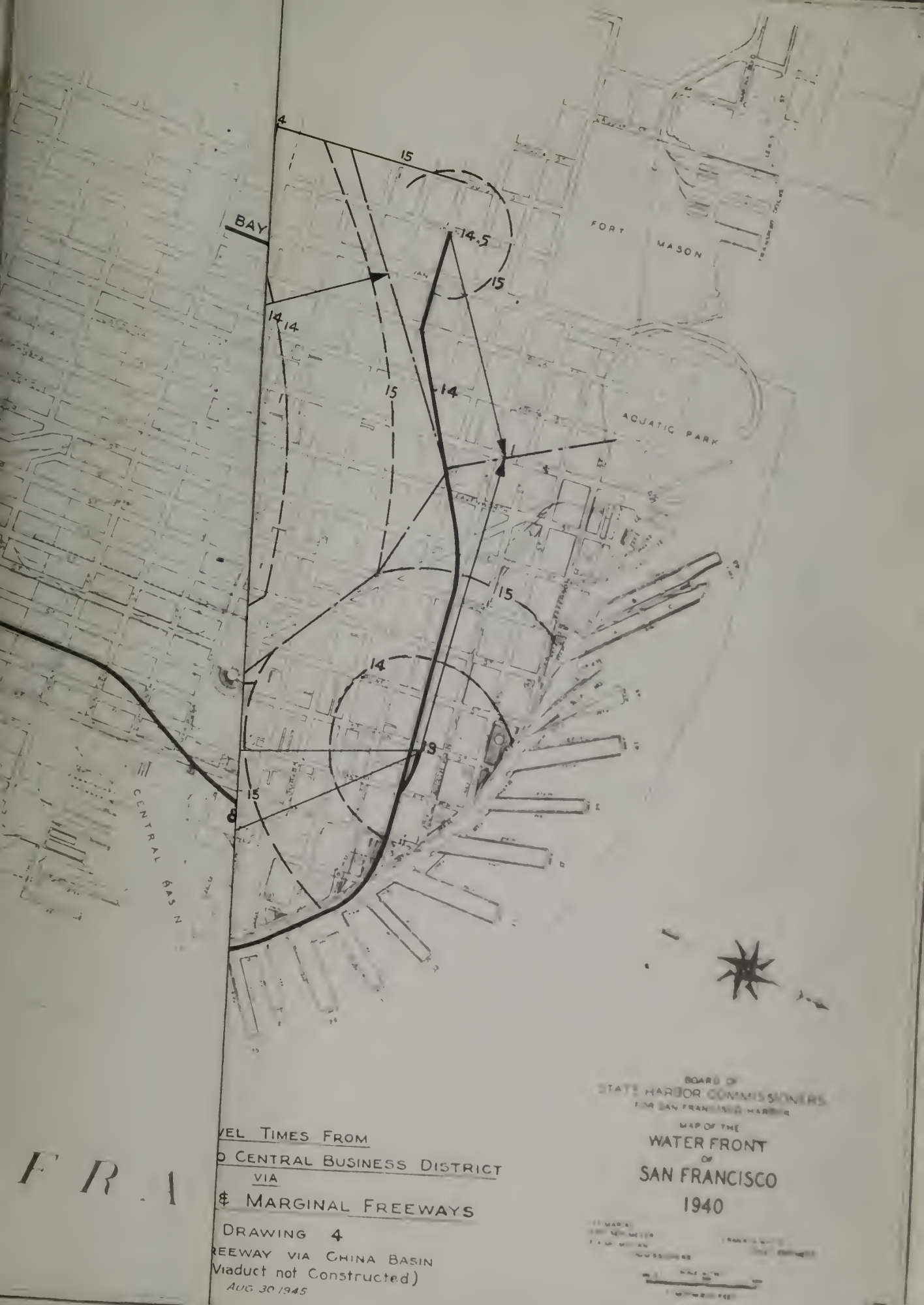
DRAWING 4

MARGINAL FREEWAY VIA CHINA BASIN
(Sixth Street Viaduct not Constructed)

AUG 30 1945

BOARD OF
STATE HARBOR COMMISSIONERS
FOR SAN FRANCISCO HARBOR

MAP OF THE
WATER FRONT
OF
SAN FRANCISCO
1940



F R 1

VEL TIMES FROM
O CENTRAL BUSINESS DISTRICT
VIA
& MARGINAL FREEWAYS

DRAWING 4

REEWAY VIA CHINA BASIN
(Viaduct not Constructed)
AUG 30 1945

BOARD OF
STATE HARBOR COMMISSIONERS
FOR SAN FRANCISCO HARBOR

MAP OF THE
WATER FRONT
OF
SAN FRANCISCO
1940

	DESCRIPTION	DATE

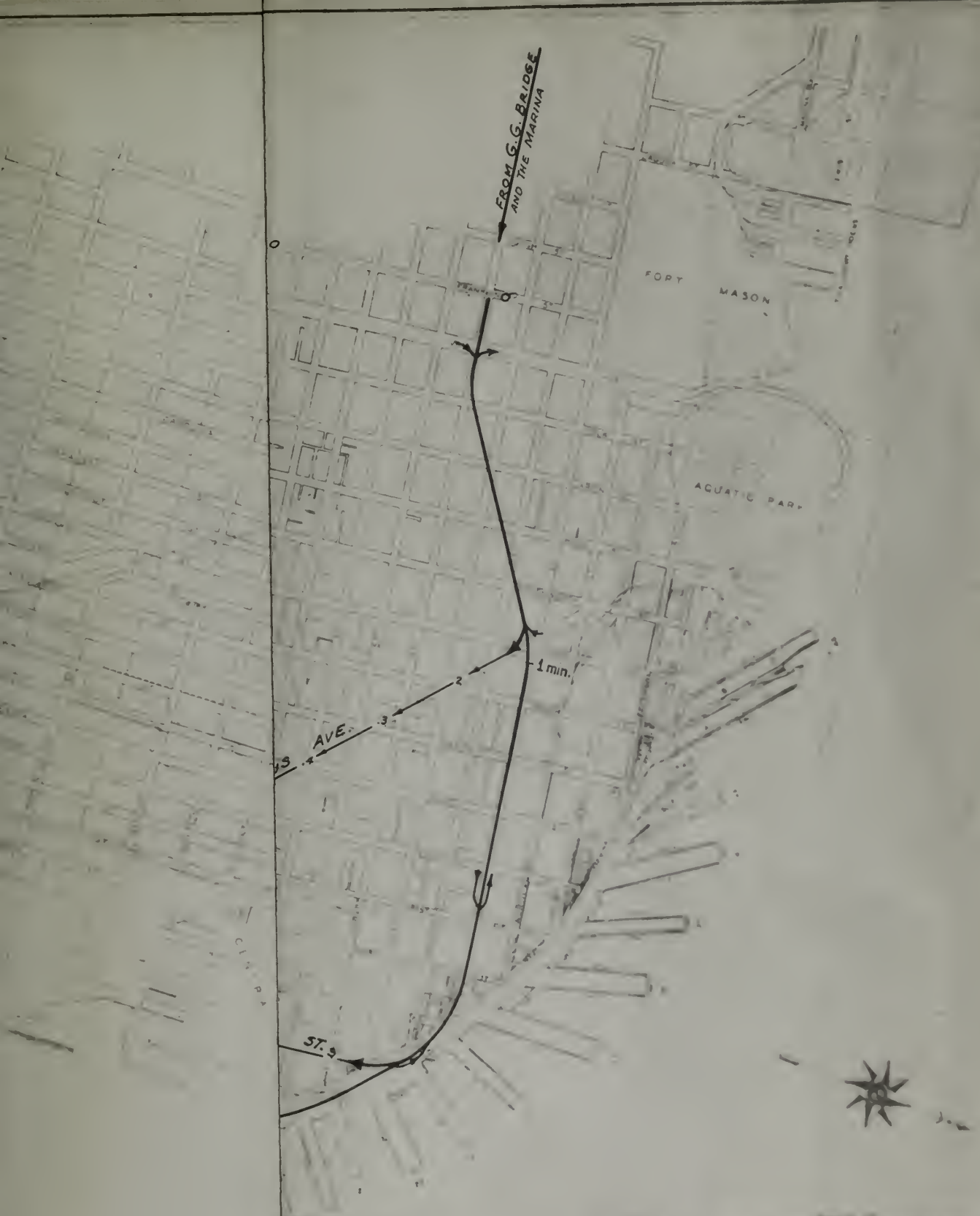
WOODRUFF & SAMPSON
ENGINEERS
333 MONTGOMERY ST. SAN FRANCISCO 4.

TRAVEL TIMES FROM VAN NESS AVE. TO THE CENTRAL BUSINESS DIST. VIA VARIOUS ROUTES

MADE BY	A.M.J.	SCALE	JOB NO.
CHECKED BY		DATE AUG 30 1945	
		DRAWING NO. 5	

BOARD OF STATE HARBOR COMMISSIONERS SAN FRANCISCO HARBOR

USE OF THE WATER FRONT IN SAN FRANCISCO 1940



BY	DIVISION DESCRIPTION	DATE

WOODRUFF & SAMPSON
ENGINEERS
MONTGOMERY ST SAN FRANCISCO 4.

TRAVEL TIMES FROM VAN NESS AVE.
TO THE CENTRAL BUSINESS DIST.
VIA
VARIOUS ROUTES

BY	AMJ	SCALE	JOB NO.
CKD BY		DATE AUG 30, 1945	
		DRAWING NO. 5	

BOARD OF STATE HARBOR COMMISSIONERS
SAN FRANCISCO HARBOR

WATER FRONT
OF
SAN FRANCISCO
1940

ALTERNATE "D"

NORTH POINT SEWAGE TREATMENT PLANT

RECOMMENDED

ALTERNATE "C"

LOMBARD

ALTERNATE "B"

GREENWICH

FILBERT

ALTERNATE "A"

UNION

GREEN

VALLEJO

BROADWAY

BROADWAY TUNNEL

COLUMBUS

LEAVENWORTH

HYDE PL

JONES

TAYLOR

MASON

POWELL

STOCKTON

GRANT

KEARNY

MONTGOMERY

SANSOME

BROADWAY

EASTERLY

FRONT

DAVIS

FRANKLIN

VAN NESS

POLK

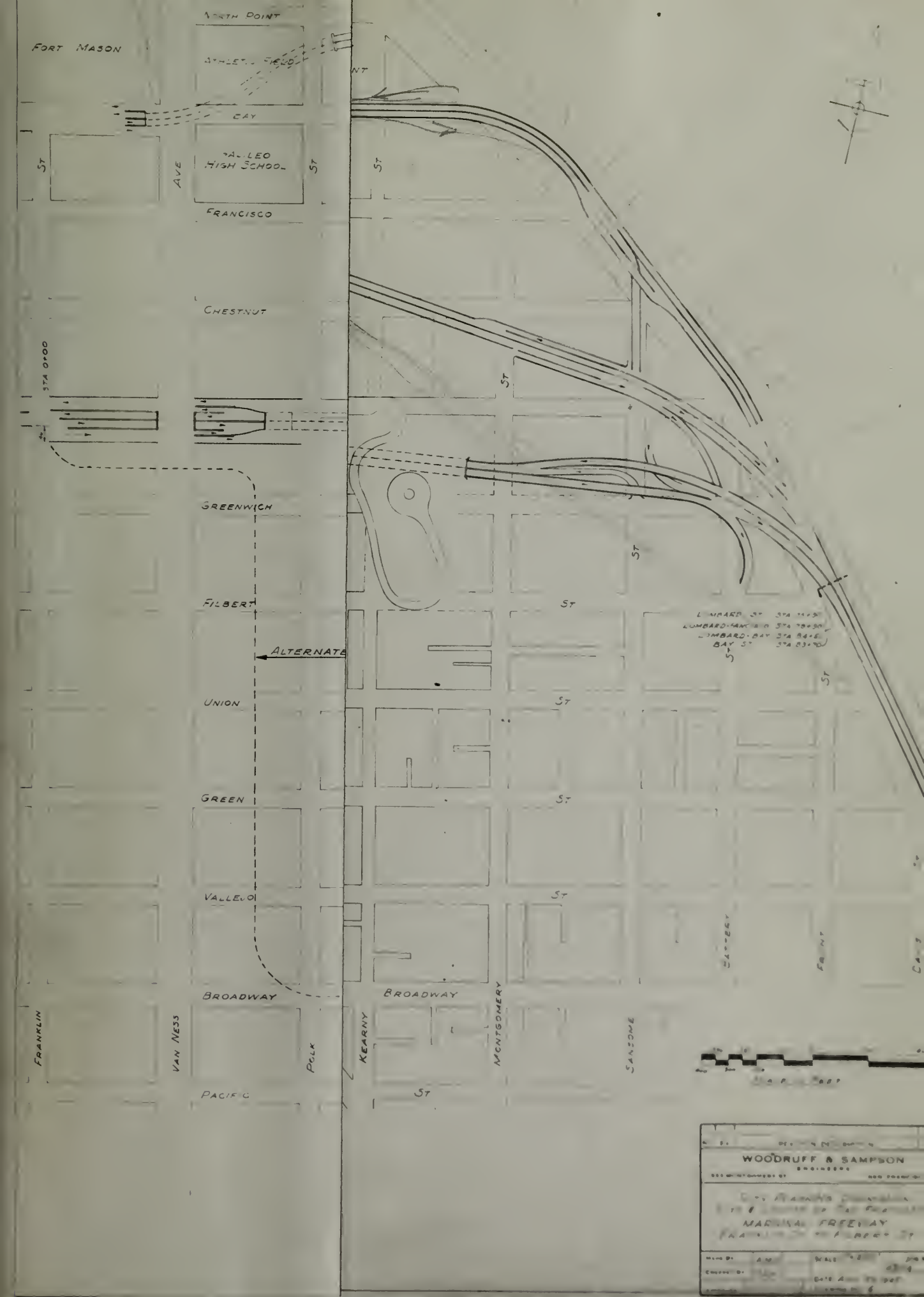
LARKIN

1" = 400' A.P. in FEET

WOODRUFF & SAMPSON
ENGINEERS

CITY PLANNING COMMISSION
CITY & COUNTY OF SAN FRANCISCO
MARGINAL FREEWAY
FRANKLIN ST. TO FILBERT ST.

DRAWN BY: A.N.J. SCALE 1"=200' JOB NO. 4804
CHECKED BY: F.W. DATE AUG. 30 1945
APPROVED: DRAWING NO. 6


NORTH POINT
FORT MASON
ATHLETIC FIELD
BAY
VALLEJO HIGH SCHOOL
FRANCISCO
CHESTNUT
STA 0+00
GREENWICH
FILBERT
ALTERNATE
UNION
GREEN
VALLEJO
BROADWAY
BROADWAY
FRANKLIN
VAN NESS
POLK
KEARNY
MONTGOMERY
SANSOME
PACIFIC
WOODRUFF & SAMPSON
ENGINEERS
MARINA FREEWAY

PROFILE - BAY & NORTH POINT STS.

(Alternate 5)

Length of Tunnel 2150'

PROFILE - LOMBARD: FRANCISCO ST.

(Alternate 'C')

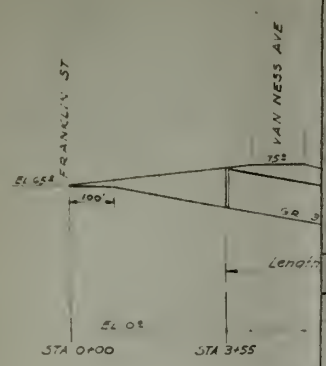
(Alternate 'B')

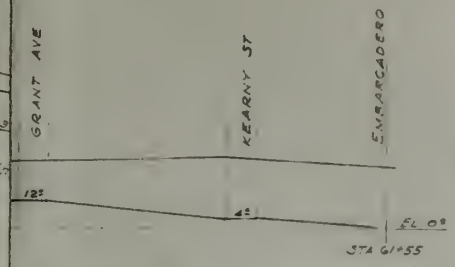
W. DORUIT & SAMPSON

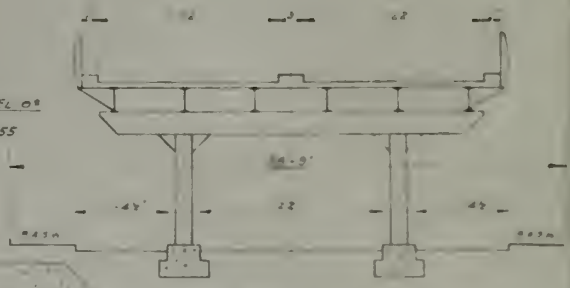
SAN FRANCISCO

BAY

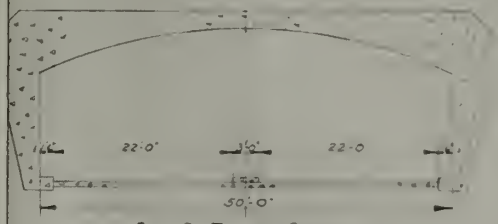
FLEEVAL



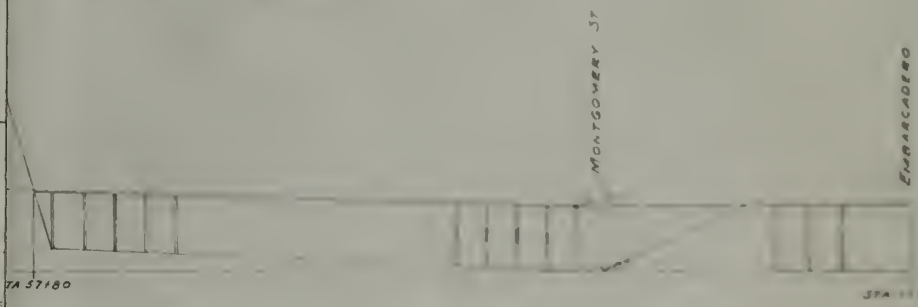


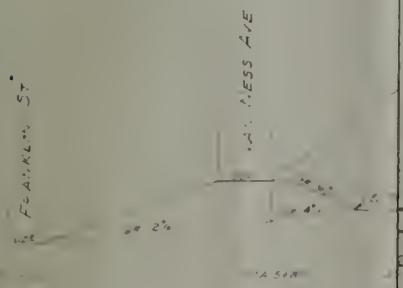


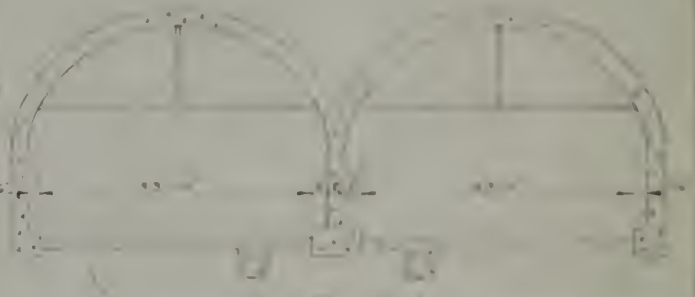
TYPICAL VIADUCT SECTION

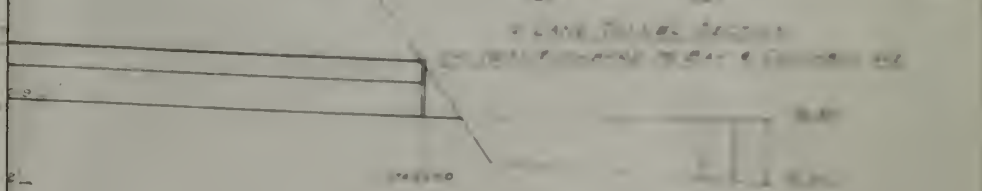


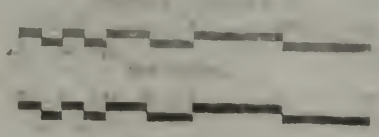
BAY ST TUNNEL SECTION

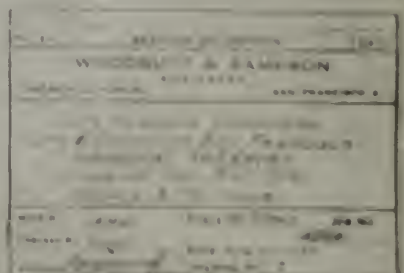


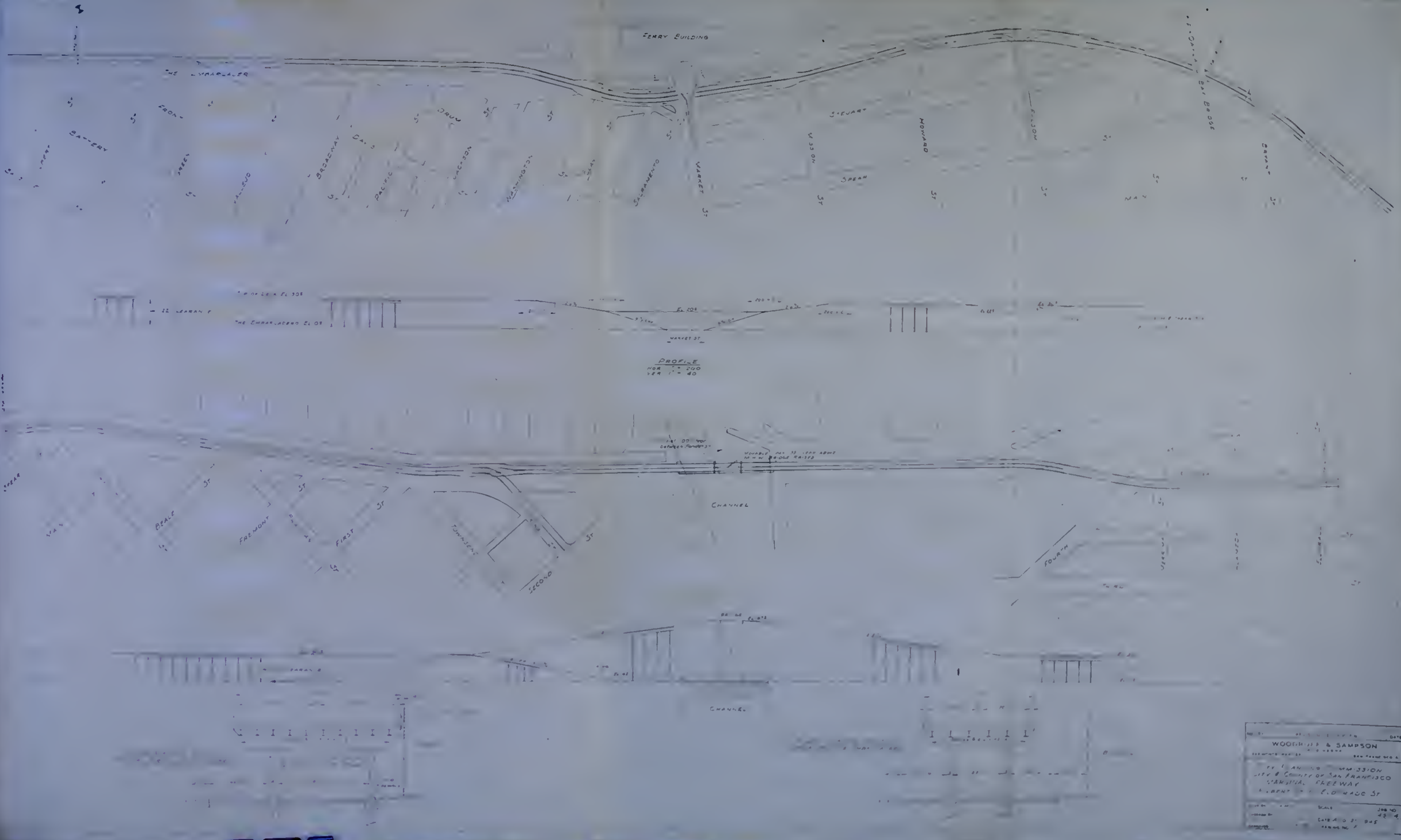


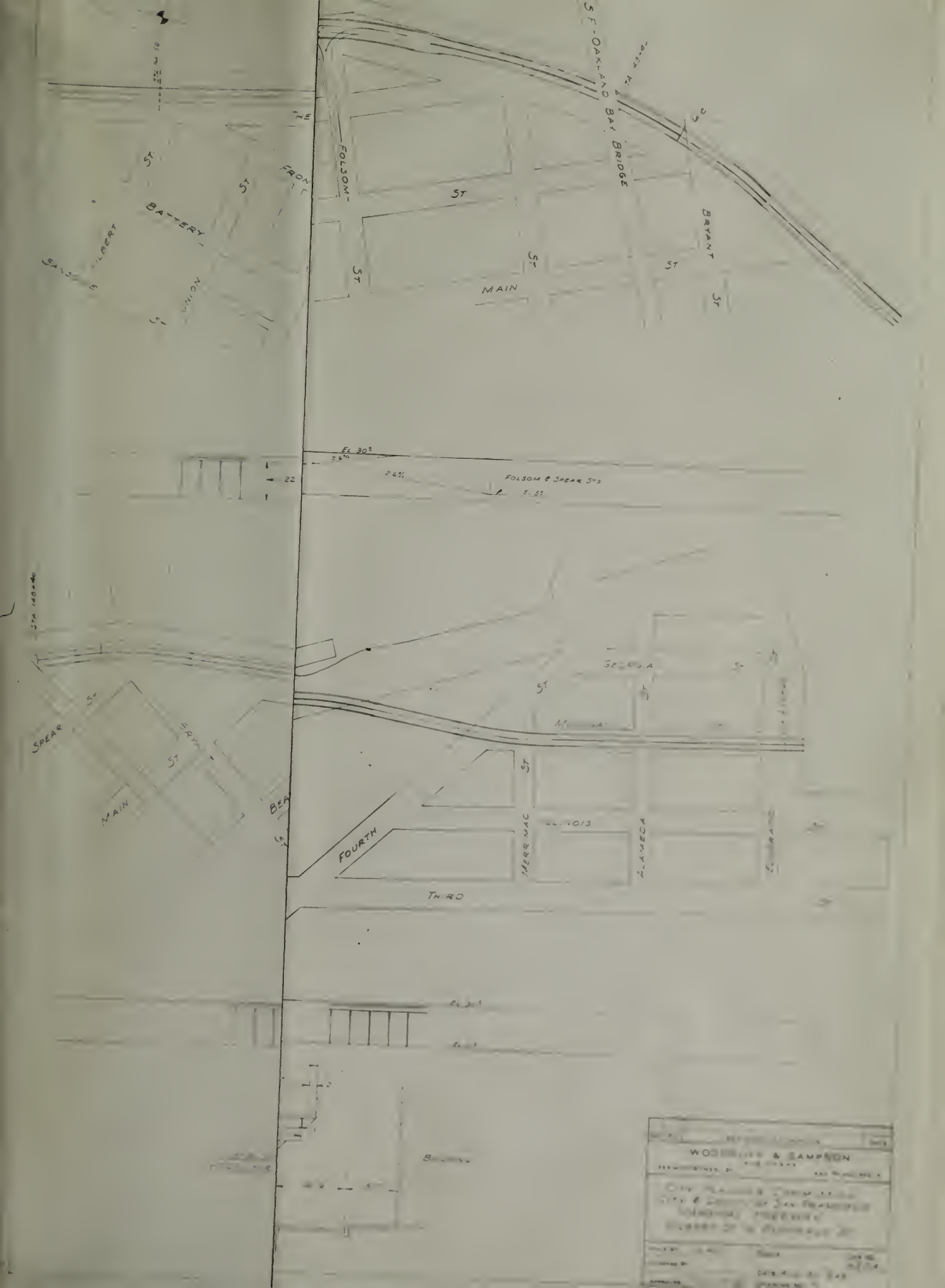






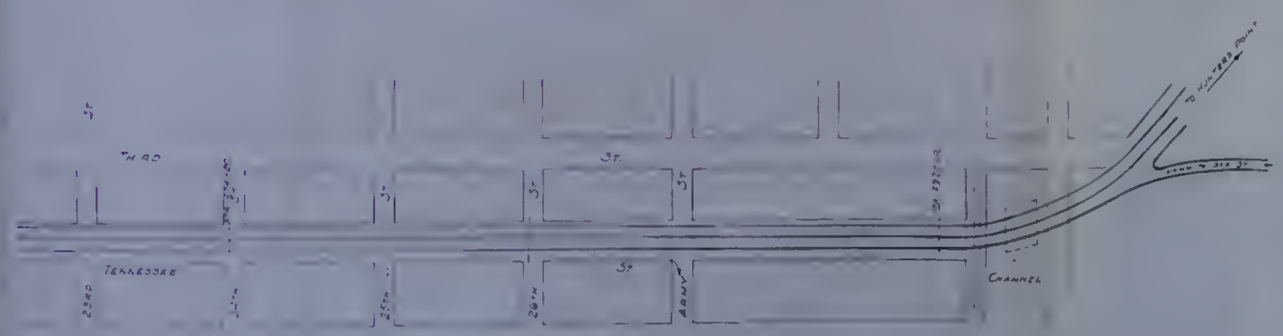



FERRY BUILDING
EMBARCADERO
BATTERY
FRONT
DRUM
BROADWAY
PACIFIC
JACKSON
WASHINGTON
CLAY
SACRAMENTO
MARKET ST.
STEUART
SPEAR
HOWARD
MAIN
BAY BRIDGE
MARKET ST
PROFILE
HOR 1" = 200
VER 1" = 40
BEALE
FREMONT
FIRST
TEMPORARY
SECOND
CHANNEL
FOURTH
WOODWARD & SAMPSON
CITY & COUNTY OF SAN FRANCISCO
EMBARCADERO FREEWAY
P.O. WAGE ST

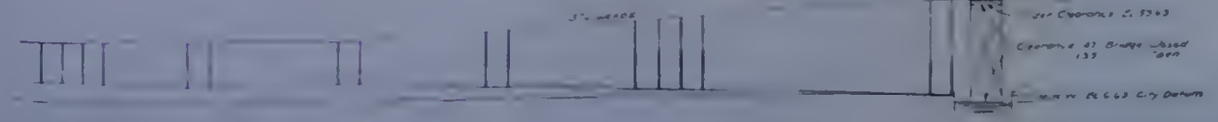

S.F.-OAKLAND BAY BRIDGE
FOLSOM
FRONT
BATTERY
SANSOME
MAIN
BRYANT
ST
EL 30.0
2.6%
FOLSOM & SPEAR STS
SPEAR
MAIN
FOURTH
THIRD
MERRIMAC
ALAMEDA
WOODBRIDGE & SAMPSON

PLAN
Scale 1" = 100

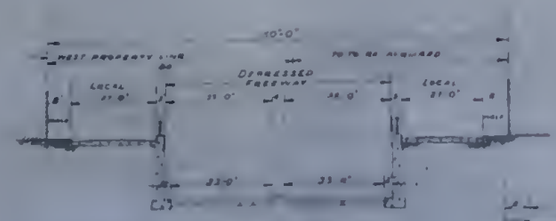
PROFILE
Scales HOR 1" = 200
VERT 1" = 40



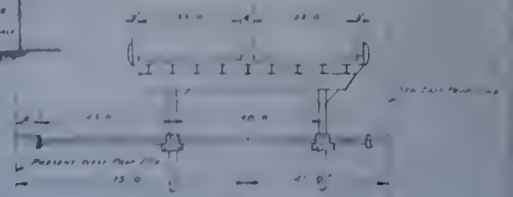
PLAN
Scale 1" = 200



PROFILE
Scales HOR 1" = 200
VERT 1" = 40



PROPOSED SECTION
FOR TENNESSEE STREET

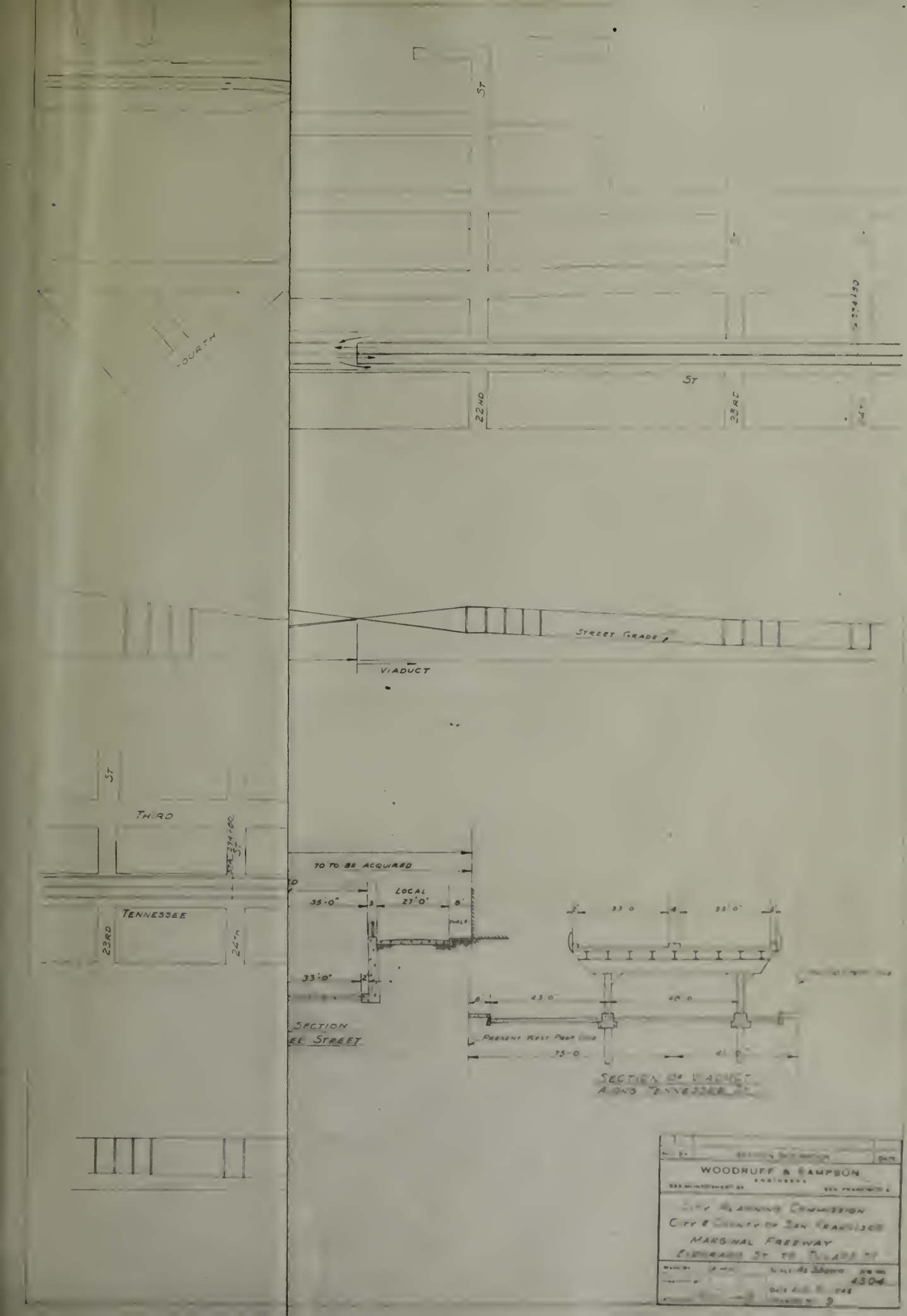


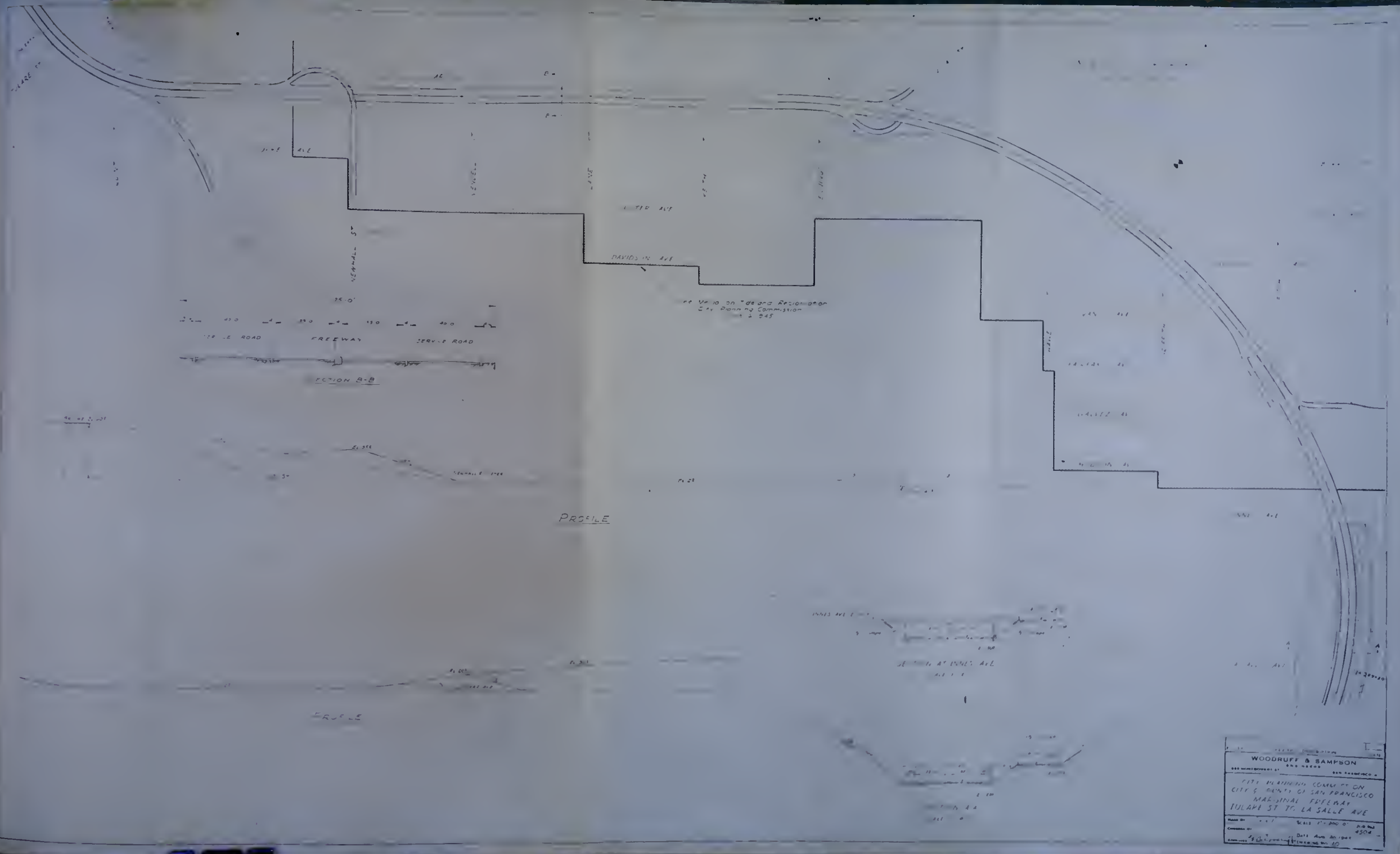
SECTION OF VIADUCT
ALONG TENNESSEE ST

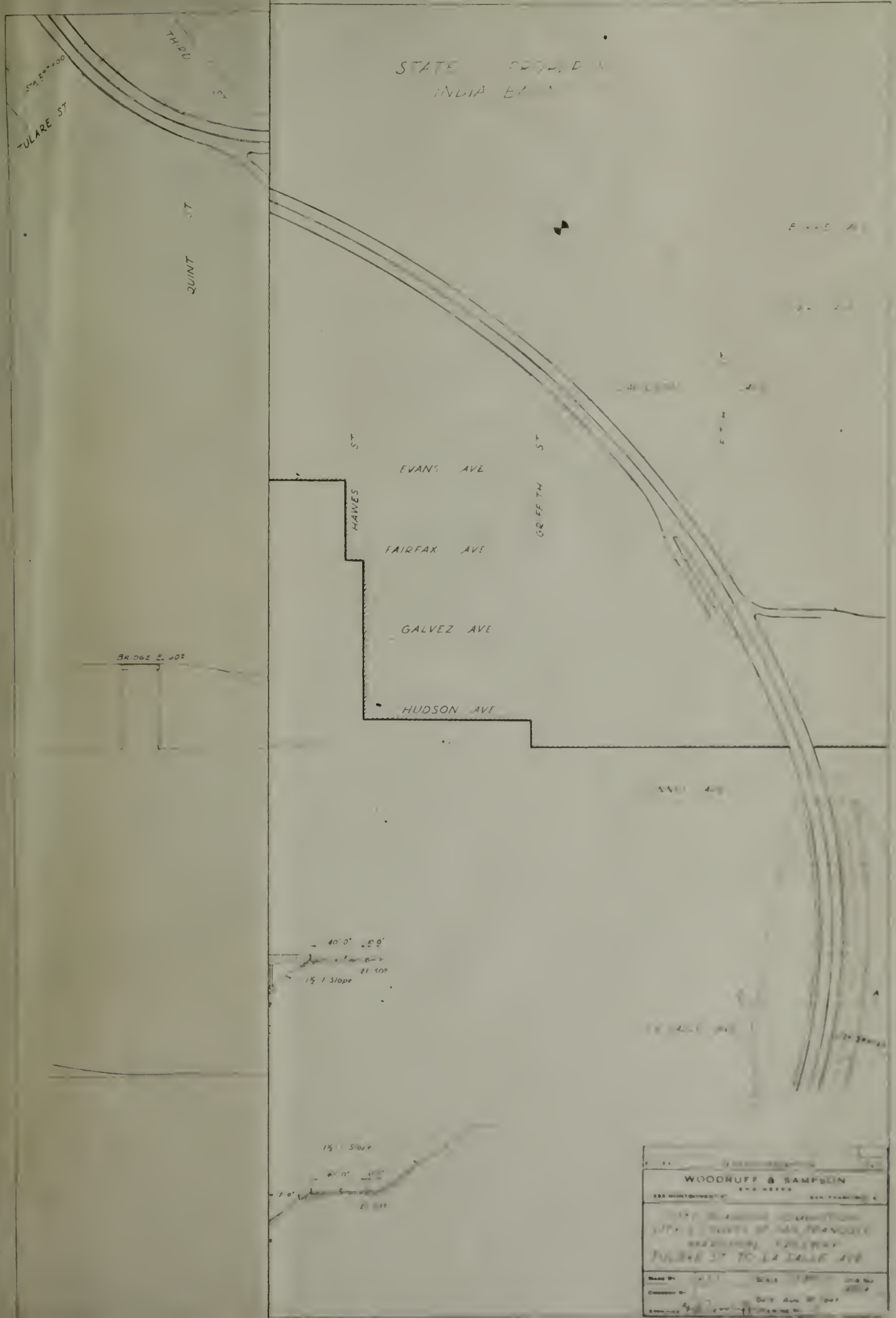
WOODRUFF & SAMPSON
ENGINEERS

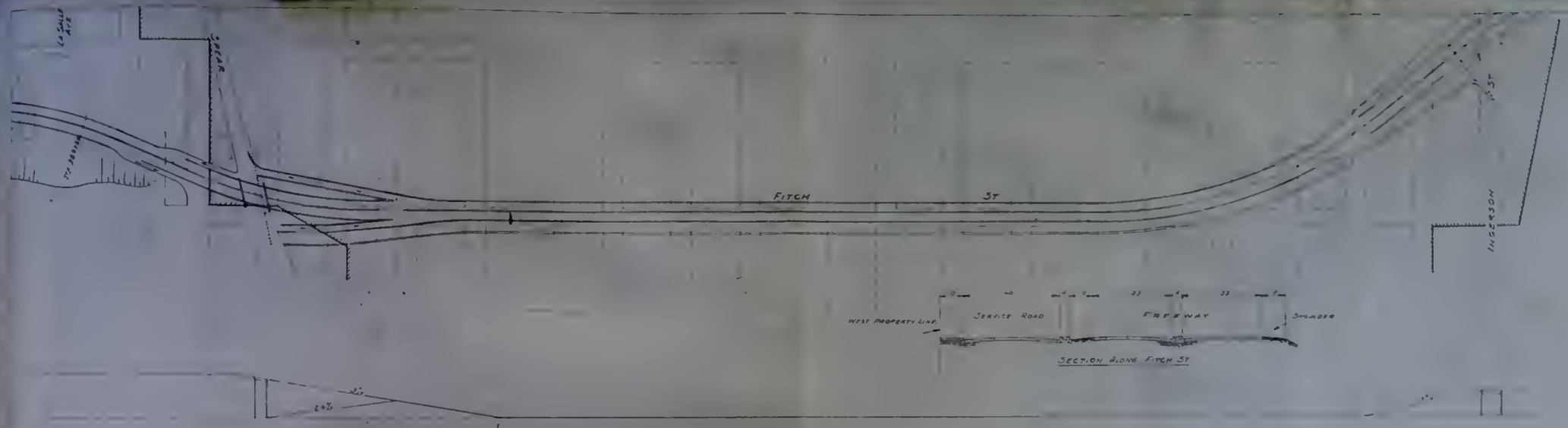
CITY PLANNING COMMISSION
CITY & COUNTY OF SAN FRANCISCO
MARGINAL FREEWAY
ELDORADO ST TO TULARE ST

DRAWN BY A.M.V.
TRACED BY
CHECKED BY
DATE AUG 30 1945
JOB NO 4504
DRAWING NO 9


ST
FOURTH
ST
22ND
23RD
STREET GRADE
VIADUCT
ST
THIRD
ST
TENNESSEE
23RD
24TH
70 TO BE ACQUIRED
LOCAL
35'-0"
27'0"
33'-0"
SECTION
EE STREET
PRESENT WEST PIER LINE
75'-0
SECTION OF VIADUCT
ALONG TENNESSEE ST
WOODRUFF & SAMPSON
CITY PLANNING COMMISSION
CITY & COUNTY OF SAN FRANCISCO
MARGINAL FREEWAY
FOR GRADES ST TO

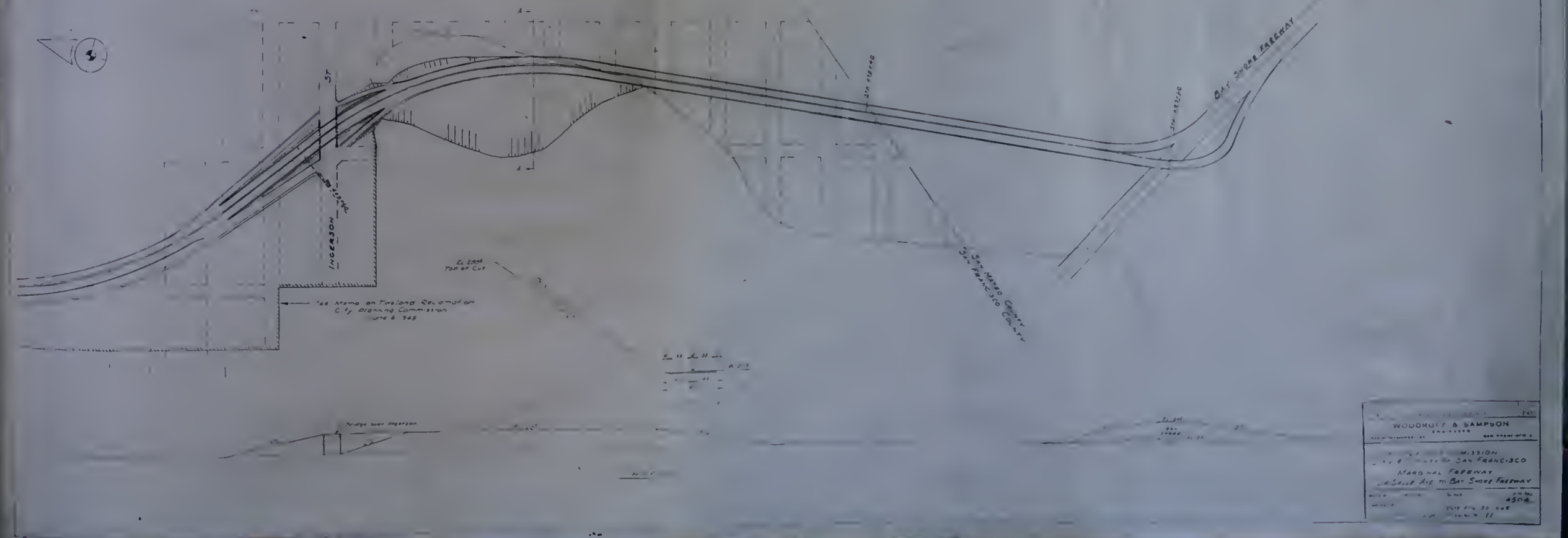

DAVIDSON AVE
FREEWAY
SERVICE ROAD
SECTION B-B
PROFILE
WOODRUFF & SAMPSON
CITY PLANNING SURVEY ON
CITY & COUNTY OF SAN FRANCISCO
MARGINAL FREEWAY
TULARE ST TO LA SALLE AVE


TULARE ST
QUINT ST
EVANS AVE
HAWES ST
GRIFFITH ST
FAIRFAX AVE
GALVEZ AVE
HUDSON AVE
1% Slope
WOODRUFF & SAMPSON



SECTION ALONG FITCH ST

PROFILE

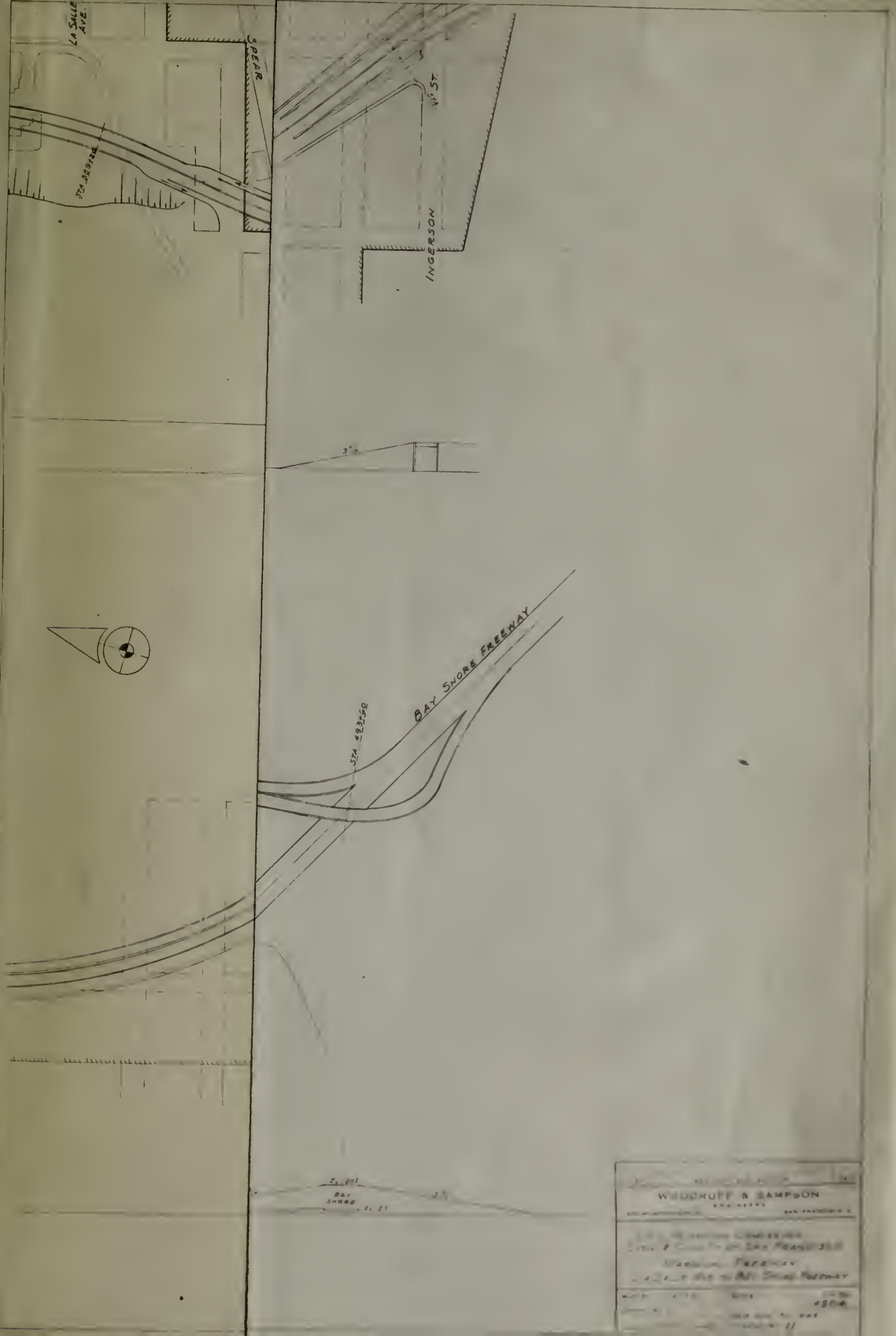


WOODWORTH & SAMPSON

MISSION
AT SAN FRANCISCO

MARGINAL FREEWAY
LA SALLE AVE TO BAY SHORE FREEWAY

4504


LA SALLE AVE.
SPEAR
STA 329+24
11th ST.
INGERSON
3%
BAY SHORE FREEWAY
STA 493+50
WOODRUFF & SAMPSON